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FOURTH ANNUAL REPORT

OF THE

STATE BOARD OF HEALTH

OF

NEW YORK.

BOSTON MEDICAL
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STATE OF NEW YORK.

No. 89.

IN ASSEMBLY,

FEBRUARY 21, 1884.

FOURTH ANNUAL REPORT OF THE STATE BOARD OF HEALTH.

STATE OF NEW YORK:

EXECUTIVE CHAMBER,
ALBANY, *February* 21, 1884.

To the Assembly:

I have the honor to transmit herewith the annual report of the State Board of Health, for the year 1883

GROVER CLEVELAND.

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CONTENTS.

	PAGE.
General report of the Board	1–25
Report of executive and finance committee	29–35
Report of committee on registration and vital statistics	35–38
Report of committee on public institutions	39–45
Report on the drainage of the Tonawanda and Oak Orchard swamps	45–69
Report on the topography, hydrography and drainage of the Oak Orchard basin and swamp	70–127
Report on prevalent diseases in the State	127–228
Report on diphtheria at Batavia blind asylum	127–136
Report on diphtheria in Johnsburgh	136–144
Report on rubeola at Bergholtz	144–152
Report on enteric fever at Perrysburgh	152–158
Report on malarial fever at Lakeville, Washington county	158–168
Report on enteric fever at Day, Saratoga county	168–170
Report on fevers at Indian and Blue Mountain lakes	170–176
Report on endemic in Putnam county	177–180
Report on Piscawan creek	180–183
Report on enteric fever at Port Jervis	184–207
Proximate cause of malarial disease	208–213
Brief account of typhus fever in New York	213–216
Lung plague of cattle	216–219
Report on diphtheria at Indian lake	219–225
Report on diphtheria at Slingerlands	225-227
Report of committee on effluvium nuisances	229–248
Report of sanitary committee	249–263
Report on manufacture of Neufchatel cheese	263–267
Report of milk inspectors for the year 1883	267-269
Report on milk, fresh and condensed	269–311

PAGE.
Report on examination of kerosene oil..... 312–318
Report on Glen Cove Manufacturing Company 318–380
Report on drainage of abandoned Chemung canal 381–391
Report on pond nuisances in Westchester county 391–399
Report on pond nuisances in Dutchess county..... 399–405
Report on coves near Rhinebeck..... 405–407
Report on Hartland nuisance..... 408–418
Report on malaria at Castleton..... 418–423
Report on Glucose Factories at Buffalo 425–429
Report on milk and its adulterations 429–442

626

REPORT.

To Grover Cleveland, *Governor of New York:*

Sir — The State Board of Health, in its fourth annual report, presents the record of its transactions, together with such suggestions concerning the needs of the public health service as four years' practical study of the subject would warrant.

The sudden death of the Secretary and chief executive officer of this Board, Dr. Elisha Harris, in the midst of his usefulness, before the completion of this report, must be the apology for any imperfections it contains.

The points briefly discussed will be found under the following

Subdivisions.

Prevalent diseases in the State during the past year.
Sanitary Districts.
Vital Statistics of the State.
Statistical Nomenclature of the Causes of Death.
School Hygiene.
Swamp and Drainage Investigations.
Lung Plague in Cattle.
References from the Governor.
Stench Nuisances.
Adulteration of Food and Drugs.
Law to Regulate Standard of Illuminating Oils.
Sanitary Work of New York Quarantine.

The Public Health and Preventable Diseases in the State in 1883.

In so far as the healthfulness of the people of this State is affected by what are known as the preventable diseases, the report to be made is one of satisfactory immunity. These diseases, while often prevailing to a degree constituting a scourge to the community, carrying off large numbers of the people, and destroying many valuable lives, have not anywhere within the limits of the Commonwealth this year caused such possible

extraordinary results. There has been a material improvement over last year. Inasmuch as these diseases, as their general name implies, are susceptible, to a large degree, of prevention, and are amenable to recognized laws of health, which study of them has formulated and is more and more perfecting, they furnish material for most interesting work on the part of those to whom the care of public health is delegated. While conditions will arise that cannot be foreseen and warded off which will favor their outbreak and make it possible for them to occur to a disastrous degree, it is, nevertheless, clearly evident that much of the immunity which the State has enjoyed during 1883 has been the result of systematic work already instituted, the machinery of which lies in this and the local boards of health. In Little Falls for example there has been a very material reduction in the sickness and death from typhoid fever as a direct result of efforts put forth there for its suppression. The same is true elsewhere.

The public health is believed to have been generally quite up to the average, not only as affected by diseases which depend upon causes that are known to be remediable in a general way, but as dependent upon all the causes by which death comes to mankind.

The securing of returns regarding sickness and death from all parts of the State, depending as it does on a well-established machinery and a formed habit of making them, has yet to be fully perfected. The government of the State should have such an organized internal service as will enable it to be regularly informed of the state of the public health throughout the whole of its territory. To secure this, in addition to what has already been done by distribution of printed card schedules (as No. 30 of the Board's printed material for issue) there has recently been prepared, with much care, a larger sheet for the summary abstract, quarterly, of the records of deaths, births and marriages in every health district or other region of the State. Especial attention is given in it to the abstract of the records of mortality, giving causes, ages and ratio to the population, and specifying, regarding the more dangerous infectious diseases, pulmonary and other inflammatory diseases, some intimation regarding the prevalence of the disease, the causes and other conditions attending the diseases reported. It is expected that coming from health officers these will bring in more perfect knowledge to this central office of the condition of the people of the State respecting the matter of sickness and mortality. There has also been prepared a blank memoranda for recording endemic and epidemic diseases, by means of which returns of these may be made by medical men.

The Acute Infectious or Contagious Diseases.

Diphtheria. — This disease has existed in various parts of the State. Altogether, however, the number of localized epidemics has not been large and it has not prevailed anywhere as a widespread epidemic, although in several instances it has, in its characteristic way, fallen suddenly upon a locality and carried off a number of those affected by it. The mortality from it, proportionately very severe in some instances, has throughout the State been small as compared with former years. In some instances it exists as a continuance of a fixed epidemic now of several years' duration. These have been the subject of expert investigation by the State and local health authorities. Being a disease which, perhaps more than any other of the infectious diseases, presents much that is conflicting as to its cause and the circumstances under which it develops, there is every incitement to the exact and comprehensive record by patient investigation of all the phenomena which variously attend it. Enough is known, however, of the causes, although as yet apparently diverse, upon which its existence depends, to very materially hamper the epidemic and destroy the contagium. The experience of another year's work in this Board has continued to demonstrate this. It is well known that the disease is spread by direct infection and perhaps contagion, by the exposure of numbers of people to the disease through public funerals of those dying of it, by similar exposure to rooms and houses where the sick have been to which the contagious material clings for a long time unless destroyed by a process of fumigation, by exposure to the inhalation of an atmosphere laden with some of the products of animal decomposition, such as the air from sewers or cess-pools improperly excluded from dwellings, schools or other institutions supplied with these excretory appliances, by the transportation of the infectious material in the clothing of persons coming in contact with it to others who are susceptible, by uncleanliness about houses, premises and streets. We know that such conditions foster and spread this malady, so terribly fatal as to often cause the death of more than half of those affected by it. It is from neglect of such conditions that the investigators of the Board have found the epidemics spreading, and on their proper rectification have secured a speedy suspension or check. Many lives have without doubt been preserved by the institution and enforcement of what is now known to be sanitary law for the management of these epidemics. In a number of cases a suddenly occurring outbreak in an institution, such as that of the Blind Asylum at Batavia, has been immediately checked by expeditiously searching for the conditions at fault and rectifying them. Like gratifying results have attended the study and management of epidemics of several years' dura-

tion, such as that at Johnsburgh, in Warren county. Meantime every epidemic has its lesson; it contributes something, by a study of it, to the fund of general knowledge of this disease — it also enforces its truths upon the experience of all those locally brought into contact with it.

Scarlet Fever. — A disease which is infectious and sometimes so malignant as this, running its fatal course with such rapidity, calls for very prompt action on the part of health authorities. Existing and spreading among children for the most part, the co-operation of school officers is especially necessary. The speedy and strict exclusion from schools where the children of a community principally congregate, of all persons connected with families in which cases occur, the quarantining of the sick, together with the disinfection or destruction of whatever has come in contact with them, and the early and private burial of those who may fall victims to the disease are the means for its limitation. In the cities and larger towns, those having the executive responsibility over the disease are generally alive to the necessities of the case. In instances reported from various localities persistence of an epidemic is attributed to the indifference of the people, organized opposition having been sometimes maintained by some who ridicule the contagious character of scarlet fever. The judicious use, however, of the authority resting in boards of health will generally overcome this, and it only remains to educate the people to accept the well-known facts regarding this dangerous malady and to co-operate with all well-intentioned efforts toward its suppression. No disease warrants more fully the dread which this destroyer of many precious lives inspires in the minds of those having children under their care, and a wise advantage of this sentiment can be legitimately taken, and a worthy work of health authorities is to direct this sentiment to intelligent operation. Scarlet fever is generally more wide-spread throughout the State than any other disease that calls for restriction and seclusion. The reports to this Board for the past year show but few places where epidemics of it have been notably severe or extensive.

Measles. — This common and well-known contagious disease, susceptibility to which is almost universal, is one which few children escape, and under favorable conditions for recovery as to age and other circumstances is not generally fatal. It differs widely from scarlet fever in the necessity involved of seclusion and quarantine. A reasonable avoidance of exposure is properly to be maintained by medical and school officers for the repression of its prevalence, and with judicious sanitary care of the sick much is effected to diminish the sum of fatality from it. This care is especially requisite in crowded asylums and schools. As would be anticipated, much of the mortality reported from this cause has been due to secondary inflammation of the

lungs and air passages. While doubtless there have been few localities of the State, at all closely inhabited, entirely free from the appearance of measles, epidemics of especial importance have been reported in Westchester, Cattaraugus and Niagara counties. In the vicinity of Ellicottsville much severity has attended the outbreak. Both here and in a very extensive epidemic in the town of Wheatfield a number of cases of the hæmorrhagic variety, sometimes popularly spoken of as "Black Measles," furnished an interesting feature. A study of this epidemic has been made and a report of it will appear in its proper place.

Typhoid Fever. — Enteric fever is the established fever peculiar to this country, or at least to the older portions of the Northern States. No year passes in which it fails to make its appearance somewhere as the early autumn comes on. During the past year it has been the most prevalent of all the infectious diseases coming under the supervision of this office. A greater number of cases than usual have occurred in New York, Albany and other cities, and it has also prevailed in many of the rural regions of the State. As a considerable epidemic, it has existed, however, in but a few places. Inquiry has been made and trustworthy information sought for the development of the disease in the various localities where it has been especially prevalent. Some of these local outbreaks have been placed in the hands of the immediate sanitary investigators of this Board, a means of carrying on its work to which reference will be made in another place.

Enteric fever leaves those who speak of it as the type of filth-diseases. It is to a considerable degree related to bad sanitation. That it is not spread by contagion, in its strict sense, is certainly true. It is also known that filth and decomposition will not alone account for it, although it is often found bearing evident relation to neglected privies, and impure air from drains and sewers. It appears to be generally purely infectious, the poison being traceable to a previous case, but propagated and developed chiefly, if not entirely, outside of the body. Whether we have type essentially differing, arising from varying causes, but denominated by the one term, is a question that is raised, and is yet to be answered. Color is given to this by the variability in severity, or the presence of the characteristic features observed in different epidemics. One of the collateral duties of the health boards is to make record of the observed facts of these diseases as a contribution to the sum of increasing knowledge concerning them, and to this the State Board has incidentally addressed itself during the year. Until all are satisfied as to what causes this one special epidemic disease, why it works its devastation, and how it is to be prevented and abolished, which is doubtless yet in the distant future, this scientific study of the disease in the large areas is of practical value to the State. Work of this

kind of great value has been done by the local government board of Great Britain. Assistance has been given to local health officers and physicians toward determining the management of several individual epidemics. Some of these have been in localities where for a number of years the disease has regularly recurred. In Perrysburgh, Lansingburgh, and in Saratoga county, such has been the case, each year bringing its quota of deaths. Systematic investigation has usually reached the root of the outbreak, and measures to destroy it have followed. In other places, notably in Newburgh and Port Jervis, there has been a sudden outbreak of the disease. In the latter a special interest attaches to the epidemic by reason of its extent, more than 150 cases occurring during the fall and up to the end of the year, at which time it was practically controlled, but more particularly because of the evident traceability to milk as the distributing medium. It is now not many years since attention was called to the possibility of this universally used article of food acting as a carrier of the germs of several of the infectious diseases, notably this one under consideration. The importance of this fact and the recognition of it cannot be exaggerated. The careful seclusion of cases of typhoid fever, scarlet fever and diphtheria (all of which have now been found in a number of instances spreading by this means), when they occur about the premises of dairies and depots of milk supplies, or else the embargo of the milk itself may be regarded as a thing to be known and enforced. Misapprehension may exist as to the relation of the milk to these diseases, and it should be understood that the possibility of evil is limited to the infection of the milk by means of the seeds of the disease finding their way into it from a local existing case, either directly, as from the persons of those coming in contact with the sick, or from a well whose water has in some manner received the germs, and finds its way into the milk, or possibly through the utensils used or the appliance for washing them. It is also to be regarded as possible by reason of the foul air from drains coming in contact with these. Further detail of this matter, interesting to dairymen, as well as sanitarians, will appear more fully in the report on typhoid fever in the appendix. In many cases the rise and spread of the disease has been traced to the well-known cause of foul drinking water. A single well has in a number of instances been proved to be the source of the disease for a neighborhood, and perhaps for years. In other cases good reason has been found for impeaching the quality of the well generally for a large village, where, perhaps, the under stratum of the soil has been of a character to hold the water on a common level, and make it commonly foul. In still other cases there has been found a faulty condition of appliances for removal of excrementitous matters from dwellings and premises.

The searching out of these trite and novel causes of this disease, for some reason more especially prevalent during the year, the remedy of them as far as possible, and, of no less value, the instruction of the people in them has furnished a worthy employment of the health organization. Its value appears in the suspension, as a result, of epidemics of yearly occurrence, often kept up by violation of recognized sanitary requirements by the people ignorant of what those requirements were.

Typhus.— The possibility of the spread of this disease which there seemed reason to fear during the year preceding that covered by this report has received no confirmation. The danger then seemed imminent through the medium of the vast numbers of Italian laborers on the railroads under construction through the State, who, living a gregarious life, in large gangs closely crowded into shanties supplied with the barest necessities, and totally indifferent to the most common habits of cleanliness and decency, furnished every opportunity for the development of disease and for the breeding of typhus or like infectious fevers that might get a foothold among them from their frequent intercommunication with large cities where typhus fever existed, or possibly originated among themselves. Apprehensions that were felt of this were strengthened by the discovery of a few cases of typhus fever among these laborers on the West Shore railroad in the neighborhood of Cornwall. An inspection of their lodgings was made along the line of this road as far west as Little Falls, and some valuable information obtained as to their habits and life and how best to manage epidemics that might arise. This observation of them has been kept up during this year through the local boards of health along lines of railroad construction, to whom schedules for report have been furnished and by whom inspections and reports have been made. This observation of them to prevent the spread of disease, among them or through them, to neighborhoods in which they are temporarily located, will be continued. As far as typhus fever is concerned it is believed that no new cases of it have occurred among these people, and that the entire State has been for the most part happily free from this exotic disease.

Other Diarrhœal Diseases. — In the village of Carmel, Putnam county, there appeared during July an epidemic of considerable extent and severity, of a diarrhœal character. The report upon it by a careful investigator of the Board, Dr. J. Q. Adams, shows that within a radius of six or seven miles in and about the village, fifty-eight cases occurred, of wnich eleven were fatal. These presented much uniformity in their development, with symptoms of inflammation of the bowels and sometimes with dysentery, fever and delirium following, death resulting within two weeks. As might be expected other simple cases of diarrhœa and cholera morbus were at the same time prevalent. The causes

to which it was attributed were impure water, extremes of temperature and filth poison.

Epidemic diarrhœa has also been noted at Binghamton and has been investigated.

Such endemic and special development of disease so violently disturbing the system, certainly to be classed among the preventable diseases, are of great interest to sanitarians. The entire role that filth, in its technical sense, plays in the production of disease has yet to be exhaustively known. In such direct ways we find it or a poison from it acting on the organs first met, and which throughout their extensive tract attempting to rid the system of the poison. But in more remote directions, it or something associated with it takes a part in the generation of more typical fevers and even reaches out to effect the production of maladies with which a cursory consideration would trace no connection. It certainly is found bearing widely upon the diseases of civilized life.

The larger cities and villages bring their quota of mortality among children from diarrhœal diseases, especially among their crowded poorer classes. The problem for the relief of this is one that appeals to the highest philanthropy, and although complicated and not easy of perfect solution, much is being done to improve the condition and preserve the lives of these wards of the sanitary workers. Pure air and pure food are the ultimate desideratum.

Malarial Fever. — Paludal malaria, endemic in character, has existed in various parts of the State. It is probable that there is no year in which this is not true. It is a disease, however, which presents reasonable possibility of limitation to a more certain degree than almost any of the acute infectious diseases. Its relations to vegetable decomposition are especially favored by alternate submerging and drying of surfaces during the warm seasons of the year. Marshy grounds lightly covered with water and easily drying up under the sun, or shallow margins of mill-ponds the water of which is raised or lowered as it may be used, or the flat sedgy lands along river banks frequently overflowed have causative relations to malarial fever. Of this there has been so much demonstration that the irreconcilable facts cannot effect its ætiological value. So far as these conditions for its development can be remedied by drainage and cultivation of growing crops, it is readily apparent that the disease may be prevented. In a study of any given endemic there is nevertheless room for careful discriminating work, and the sanitary problem that is presented requires intelligent consideration, not only for the diagnosis of cause but for the prescription of the remedy. The latter may especially present difficulties of considerable magnitude, involving as it may extensive drainage and important pecuniary interests. Many

of these miasmatic areas found here and there throughout the State will, however, be brought generally under control by systematic efforts directed upon them. A number of these endemic localities have come under the observation of the Board during the year, notably at Greenwich and Argyle, in Washington county, and at Castleton on the Hudson river, and will be found in detail under the report of the committee on drainage.

Small-pox. — An epidemic of considerable gravity and calling for active and wide-spread effort on the part of State and local health boards was in operation at the time of the last report from this office in Schuyler county. It had originated entirely from one case of the disease, the subject being a passenger on the Lake Erie and Western railroad. He was removed from the train, the car disinfected and the occupants vaccinated. The disease was carried to the town of Hector and vicinity, as stated in the last report, through the medium of an occupant of the infected car, a lady of very advanced age. Instead, however, of being a carrier of the disease germs in her clothing and personal baggage as stated in the last report, it appears that she was herself taken sick with modified variola, at the residence of her son, with whom she was visiting, and to whom she communicated the disease. She had been allowed to go her way unvaccinated from the contaminated car, for the reason that she had in early life had small-pox. The case illustrates the minuteness of the care that must always be exercised in dealing with this much dreaded disease. Through the prompt action of the boards of health, a number of which in adjacent towns were stimulated into organization by the threatened danger, the epidemic, which gave promise of wide distribution because of the large number of people exposed before the disease was fairly recognized, was cut short, active measures being taken to quarantine infected districts and to protect a large number of inhabitants by vaccination. A gratifying work was accomplished in this connection in the vaccination of a large portion of the students of Cornell University, to which the president and other officers gave full co-operation.

The State has been to an unusual degree free from small-pox during the year. There have been few excepting sporadic cases in a few localities. At Waterville, in Oneida county, two or three immigrants recently arrived were taken with the disease. The value of an operative board of health there was shown in limitation of the disease to these, as by their work there was no spread of it to the inhabitants.

The extermination of small-pox depends upon two means — perfect isolation of the sick followed by complete destruction of the contagium which they generate, and vaccination. The utility of the latter, sterilizing the soil which must be congenial to the development of this and every disease germ (a factor as important as the germ itself), is always receiving fresh demonstration whenever small-pox makes its appearance.

The importance of vaccination justifies every effort at its perfection. Vaccine virus of pure quality always ready for demands for it is the desideratum. The quality of this most valuable material must be such that it will produce typical results. In securing this no one can ever be justly accused of being too critical. In this direction an unusual degree of study and investigation has been made during the year and is still going on. This has been directed, not so much toward the general testing of bovine virus, with which during a number of years the market (for it has become a marketable article) has become filled, and much of which is certainly of bad quality, as toward the search for original cases of typical kine pox and the comparison of this with accepted virus of the common descent and with humanized or, as it is sometimes known, Jennerian virus. It is hoped in the pursuit of this study by systematic inquiry and observation through the selected investigators of this Board in different parts of the State to make some valuable contribution toward the settlement of questions of matter and methods relating to this good gift from the immortal Jenner. The avoidance of much evil has already been learned. Besides the presenting an acceptable vaccine virus it remains still to induce the people to generally receive it. This must be a matter of education to lead them to a just view of it, to overcome indifference and prejudice which is often violent.

Consumption and General Diseases.— Pulmonary consumption is coming to the front as among the diseases that are called preventable. The medical mind is in a maze of facts and deduced theories regarding it, and it is well not to be satisfied about it until all the facts are in. But there can be no doubt that it is much more likely to develop, as in consonance with much that is accepted regarding it at this time, in the presence of an atmosphere contaminated by air from sewers or by overcrowding, ill-ventilated rooms, by damp cellars and premises, by want of sunlight and good food. Attention was called to these preventable factors of the disease in the last report of the Board. How much the public health organizations can do to diminish the frequency of a disease which causes such a great percentage of the deaths of this State can be seen mainly by estimating its capacity to remove the conditions that favor it from school buildings, factories, places of public assemblage and the like where many are gathered to create or be exposed to them, and by disseminating the necessary knowledge among the people that may lead them to apply the regulations that good health requires to their homes. This will be making a considerable step toward prevention of most of the preventable diseases.

There are no notable facts to record or call attention to regarding the prevalence of this disease during the year, neither is there information in this central office of noteworthy prevalence of any other of the common general diseases aside from those to which reference has already been made.

Sanitary Districts and Sanitary Investigation.

The first duty imposed upon the State Board of Health by its organic laws require that it should take cognizance of the interests affecting the health of the people and to make inquiry respecting the causes of disease, especially of epidemics, and to investigate the sources of mortality. Much of this work is to be done by the local boards, organized in villages and townships, with which the central board may often co-operate. Cases arise, however, which either do not come strictly under the supervision of the local boards, or require more expert study than lies within their control by reason of the gravity or wide distribution of the condition, that may exist, so that the advice and consultation of the State Board is called for, or this Board may be under an obligation to directly investigate and inform itself regarding sanitary matters in various parts of the State. Whenever the presence and cause of destructive diseases, or conditions that may lead to them, demand this service of the Board, the President and Secretary, with the Standing Committee on Vital Statistics, are required to cause the necessary investigations to be made. Two years ago the Board approved of the division of the State into sanitary districts for the purpose of ætiological and sanitary investigation and the plans then begun have become gradually developed, so that now seven geographical subdivisions have been made of the entire State for this purpose, and district investigators and experts assigned to them, who are residents of their respective districts.

These districts are known as the (1) Maritime district, the (2) Hudson Valley and Northern district, the (3) Mohawk and Adirondack district, the (4) Central district, the (5) Southern Tier district, the (6) Western Central district, and the (7) Western district. The first comprises all that section of the State south and east of and including Rockland and Westchester counties. The second comprises Putnam, Orange, Dutchess, Ulster, Greene, Columbia, Delaware, Sullivan, Schoharie, Schenectady, Albany, Rensselaer, Washington, Saratoga, Warren, Essex, Clinton, Franklin and St. Lawrence counties. The third comprises Montgomery, Herkimer, Fulton and Hamilton counties. The fourth comprises Otsego, Chenango, Madison, Oneida, Lewis, Jefferson, Oswego, Onondaga and Cortland counties. The fifth comprises Broome, Tioga, Tompkins, Schuyler, Chemung, Steuben, Allegany, Cattaraugus, and Chautauqua counties. The sixth comprises Cayuga, Seneca, Yates, Ontario and Wayne counties. The seventh comprises Monroe Livingston, Wyoming, Genesee, Orleans, Niagara and Erie counties. The following, known as district investigators and experts, have been selected for the respective districts: The first — Drs. Alfred L. Carroll, New Brighton, R. M. Wyckoff, Brooklyn, E. H. Janes, New York, and Wm. S. Gooen, Stony Point; the second — Drs. F. C. Curtis, Albany,

Wm. Hailes, Albany, R. V. K. Montfort, Newburgh, Wm. H. Bailey, Albany, F. U. Sherman, Ogdensburg, George F. Brooks, Albany, and James S. Cooley, Luzerne; the third — Drs. Eugene Beach, Gloversville, M. McMartin, Amsterdam, and A. W. Suiter, Herkimer; the fourth — Drs. Caleb Greene, Homer, John G. Orton, Binghamton, and Alfred Mercer, Syracuse; the fifth — Drs. H. D. Wey, Elmira, John Winslow, Ithaca, and Prof. James Law, Ithaca; the sixth — Dr. I. H. Jewett, Canandaigua; the seventh — Drs. Richard Mott Moore, Rochester, and Prof. R. A. Withaus, Buffalo.

This force of collaborators are always at the service of the Board to be called upon by it for aid in the pursuit of any work that may be called for in their various districts, either taking note of matters requiring the attention of the Board and reporting to it, or being assigned to work as the need of it may appear at the central office, or in cases of immediate necessity, taking the initiative of it. The first named in each district will have opportunity to examine records and to participate in any investigation in his district. In cases requiring cost, expenditure, or warrantable only under official badge, or calling for collateral research as chemical analysis or engineering work, authorization is to come from the central office of the Board. This force of co-workers bring the Board into direct contact with local conditions throughout the State and being selected as themselves fitted well for the expert investigation which form and are the required duty of the Board to effect, constitute an important arm of its service. By their aid, together with that of the best chemists and laboratories in the State, with naturalists and cultivators of microscopic and physiological research which the Board has in its organization, the Board is in position through these co-operative forces to meet practically and scientifically the demands that may legitimately come upon it in the pursuit of its sanitary work.

Registration and Vital Statistics.

The aim of the State System has from the first been to provide for those parts of its territory not already fully equipped with such means for recording its vital movements as would meet the requirements of the State standard, thus enabling a complete census to be made periodically of the births, deaths and marriages occurring within the State.

In furtherance of this object attention has been directed to the organization of local boards of health in the towns, villages and cities of the State where this branch of service had hitherto been neglected. The correspondence entailed by this undertaking was considerable; for the law being new and regarded as somewhat of an innovation on old established customs, not only had its provisions to be explained, but assistance had to be rendered in guiding these new boards during their

formative period, in the framing of their regulations and in the procuring of registry supplies, till they became fully established on a useful and sound basis.

The registration duties of a locality seem to constitute the foundation of its board of health. They insure it a constant source of occupation to preserve it intact and keep it ready for activity when threatened disease, needed quarantine or sanitary improvements call for its interference. They act as a constant gauge by which the healthfulness of the place may be determined, and people kept on the alert against all kinds of unsanitary conditions that injuriously affect the public health.

The extent to which local organizations have been effected is gratifying, considering the opposition to innovations. The utility of the registration law has never been questioned, and no serious obstacles have been placed in the way of its enforcement. The chief difficulties so far experienced have been such as might naturally have been expected from the imposition of a duty, which to many brought with it no corresponding remuneration. Many physicians have unwittingly overlooked its provisions from long continued habit of doing differently, and others have deemed it too great a labor to make out and forward certificates of death and birth, in some cases complaining of even paying postage out of their own pockets ; while the efficiency of the arrangement of collection of certificates by means of school district clerks from physicians and others within their district, and forwarding them to the town clerk for registration, has been marred by the silence of the law regarding the proportion of the fifty cents recording fee that should be paid for their service. The committee on vital statistics are of the opinion, that fifty cents per record is sufficient to cover all expenses incurred in getting the certificate from the party authorized to grant it to the registrar's office, and having it duly recorded in the local office. They also wisely recommend that physicians and others be provided with stamped and addressed envelopes, to transmit their certificates to the town clerk or local registrar, the cost of such to be defrayed out of the fifty cents allowed by law. Obstacles have been experienced in the perfect registration of marriages, arising from the defects of existing laws, and hence the progress in this branch of public records is less satisfactory than had been anticipated. The direction in which legal remedies must be applied are plain, the only question at issue being the propriety of the legislation itself. The defects of the present marriage laws for registry purposes may be thus summarized :

1. None of the general statutes indicate by whom the facts for public registration shall be furnished.

2. No person is required to attest and file the records of marriage in any public office (except in New York and Brooklyn), and hence no

penalty can be inflicted for failure in this duty. The committee very justly remark that the duty imposed upon ministers and magistrates who attest or solemnize a marriage, to not only satisfy themselves of the identity of the persons, but of their lawful right to enter upon matrimony, as required under chapter 25 of 1873, and by previous laws, will not be successfully complied with until the parties about to be married make out the record which is to be publicly registered. Such blank forms of record for use by families, physicians, clergymen and magistrates in this State are always ready at every registry office in the cities, villages and towns, and can be had in every school district in the State. No hardship is imposed upon the persons about to be married, however great their haste, or if it is a "Gretna Green" affair. Every man who appreciates the civil and religious obligations of marriage will be deliberate enough to prepare and file the individual records of himself and his bride previous to the ceremonial and attestation.

The granting of burial permits has been the subject of much correspondence. Who should and who should not be intrusted with this duty has been frequently asked and answered. The law remands the regulation of this matter to the local boards themselves. Each board has the power to designate the persons who shall grant burial permits. It sometimes happens that where but one individual in a village is authorized to issue these permits much inconvenience is caused by his occasional non-accessibility through absence from sickness or other cause. Yet the local boards have the regulation of this matter entirely in their own hands, and are, as they gain experience, satisfying all reasonable demands of public convenience.

Statistical Nomenclature of the Causes of Death.

Uniformity in the nomenclature of diseases has been a desideratum which it has been the attempt of the medical profession, through its scientific organizations, for many years to secure. For the purposes of vital statistics and the registry of the causes of mortality, this has been especially apparent. Need of it has stood in the way of any great advance in this part of the work of health boards. During the year there has been prepared by this Board a tabulated nomenclature, including nearly five hundred names, of diseases which cause or contribute to mortality, for the use of health officers, registry clerks and physicians of this State. These diseases are given in English with the Latin equivalent and also the name in French and German, arranged in parallel columns, and a good part of all the names of maladies that may be found in certificates of death can be registered under these placed on this list, thus securing one uniform system of recording for the entire Commonwealth. While based upon, and made to adhere closely to, the classification and nomencla-

ture of the revised lists of the committee of the Royal College of Physicians which has been for a long time under consideration and is now only tentatively issued under advisement in the form of proof sheets, no pains have been spared in the interest of exactitude and the nearest possible approach to the constantly advancing state of medical knowledge of the present time, by comparison and by the criticism of those best able to judge, to make it as perfect as possible. Until new contributions cease to be made to the science of medicine, which time is yet far distant, no effort of this sort can probably be absolutely perfect nor for many years acceptable. But it will be welcomed by all who have to do with making and recording returns of mortality and is in the important direction of exactness of record longed for by all interested in this important part of vital statistics. It will at least serve its purpose for the present, and, until the advances of medical science being made in modern times by further conquest achieved over the unknown, may in future years embody enough to make necessary the new revisal of this revision.

School Hygiene.

The thorough investigation of the sanitary wants of our common schools made by an expert of this Board in 1881, and the publication and wide distribution of his report, have created an unusual interest in the subject. Numerous applications have been made to the central office for counsel and advice with a view to remedying defects of existing structures and avoiding in new edifices the fatal mistakes of the past.

Among the principal requests was one from Cobleskill. The board of education of that village applied to the State Board for its decision on the healthfulness of the site of the present Union School building. One of the Board's medical investigators, accompanied by a sanitary engineer, visited the place in response to the application. The condition of the building called for changes to make it even habitable pending the erection of a new edifice. The site was found to be too small and the surroundings undesirable. The report of the experts appended is emphatic in its condemnation of the present structure and the need of a new building in a new locality. It is a matter of congratulation that education boards are becoming so alive to the importance of hygienic considerations as to appeal to the sanitary head of the State for advice. The glaring defects in the American system has hitherto been the sacrifice of the bodily well being to the intellectual, forgetting that the end of the modern school should be to favor, by all possible means, the gradual development of the child from the physical and moral as well as from the mental standpoints.

The field for sanitary work among our public schools is but beginning to be occupied. Much remains to be done in regard to their structure,

surroundings, methods of heating, ventilating and lighting, in regard to the relation of their system of discipline to the minds and bodies of the pupils and to the families represented.

In the Third Annual Report of this Board, it was recommended that all plans for the erection of new school buildings be submitted for approval to some competent sanitary authority before adoption ; and that the schools be subject to frequent visitations from a duly commissioned inspector, having in view solely their hygienic needs. The dwelling places of the children of this State during at least half the time not devoted to sleep should be a matter of concern to every parent. Here may be sown the seeds of robust or sickly manhood and womanhood according as the sanitary environment is good or bad. But the question reaches farther than the home, it forces itself into the legitimate domain of statesmanship. The thrift and wealth of nations are contingent upon the physical well-being of the people. Economic considerations, therefore, no less than parental solicitude are interested in having the best possible sanitary equipment for our common schools.

The practical suggestions made by the State Board of Health of Connecticut in its Fourth Annual Report having already found expression in the sanitary papers of this State Board, may with propriety be reiterated in this connection: " A law should be passed requiring a certificate of proper protection by vaccination from the family physician, health officer or town physician, before a child can be admitted to any school in the State. School officers should have power to exclude from school, children coming from a house where there is a malignant case of contagious disease until such attendance be pronounced safe by the health authorities. Children that have been sick with measles, scarlet fever, diphtheria or small-pox should be required to present a certificate of health from their family physician or from the health authorities before they shall be allowed to return to school."

Swamp and Drainage Investigations connected with the occurrence of Malarial and other Miasmatic Diseases.

This Board has been called upon to investigate the condition of swamps and water-courses in many parts of the State, in connection with the occurrence of malarial and other miasmatic diseases. In one case it has been requested to advise as to a system of sewerage for one of the large villages.

Whenever complaints have been received through proper channels stating the prevalence of disease, presumably due to swamps, water-courses or defective sewerage and drainage, they have been examined with great care, both as regards the distribution of disease and the physical conditions of the localities. Where the disease has been found

to be associated with the decay of vegetable matter due to saturation of soil, stagnant or oscillating waters, or more or less extensive swamps, the Board has endeavored to point out to the localities interested, the cause and the best remedy applicable in each case.

The most important request for investigation and remedial plans has come from the region known as the Tonawanda swamp, in the counties of Orleans, Genesee, Erie and Niagara, through the Senators representing this part of the State.

A request was received from Senators Pitts, Ellsworth, Baldwin and Titus, desiring the State Board of Health to investigate and report concerning the effect of the Tonawanda and Oak Orchard swamps, upon the health of the people in the counties named, and if these swamps were found to be injurious, to submit a plan for their sanitary drainage.

The district to be embraced in this examination covered an area of not less than three hundred square miles, in one of the most fertile parts of the State. The Board found that the maps of the western part of the State were entirely inadequate for such an investigation. In order, therefore, to proceed with this examination, it was necessary to call upon the State Survey to extend its work into this region at once, that the Board might have a reliable topographical basis upon which to proceed.

The Commissioners of the State Survey promptly responded to the request of the State Board of Health, and have furnished invaluable data for the solution of this intricate problem of the sanitary drainage of the Tonawanda swamp. The special report of the Director transmitted to this Board will be found appended in the report of the Committee on Drainage, Sewerage and Topography.

The plan prepared by the State Survey for the drainage of Oak Orchard swamp shows that it is not only perfectly feasible, but that it can be also executed for so small a sum as to render it easy of accomplishment by co-operative effort among the localities interested.

The Director's investigation regarding the rain-fall and flow from water-sheds in the western part of the State not only furnishes the necessary data for a plan of extensive drainage works required, but also has a most important bearing upon the questions of future water supplies. The general result of the State Survey work on the Oak Orchard swamp is to show that for a comparatively small sum it is perfectly practicable to drain the twenty-five thousand acres of swamp land in the Oak Orchard basin, relieving the people of an undoubted cause of serious illness, and enhancing the value of property from one to two millions of dollars.

The investigation has proceeded only so far as the consideration of

the Oak Orchard part of the swamp ; but it will be continued during the coming year into Erie and Niagara counties, along the Tonawanda creek.

Several other cases of the occurrence of miasmatic diseases in connection with large swamps have been investigated and reported upon by the drainage committee.

Another class of evils, of which some instances have been investigated, is the occurrence of malarial disease along the shores of the Hudson, where the waters of narrow and shallow bays have been cut off from the main channel by railroad embankments, and thus rendered stagnant. The reports and recommendations will be found in the report of the drainage committee appended. The most noticeable instance is in the case of Rhinebeck.

In the report of this committee will also be found a very thorough and comprehensive plan for the sewerage of the village ot Peekskill, embodying the most approved principles of both drainage and sewerage and those devices for their application which experienee has shown to produce the best sanitary results.

While the experience of the last four years, in the use of small separate sewers for carrying sewage only, has in the judgment of the Board demonstrated that they are a great sanitary improvement over the older plan of large combined sewers, the combined system is still being advocated by many engineers and others, for use in the villages and smaller cities of this State.

The costliness of these large structures has fortunately deterred most of the villages and smaller cities of the State from building combined sewers, which must eventually have a most injurious effect upon the health of the people. During the year the separate system of sewerage with its most recent improvements has been introduced into Keene, New Hampshire, and is working most successfully. On Davis avenue, Staten Island, it has also been successfully applied. There are doubtless other cases which have not been brought to the attention of the Board.

The experience of this Board shows that in the great majority of the cities and villages of this State, the storm water can easily be disposed of on the surface of the ground, and through the natural water channels, but that sub-soil drainage and sewerage are of prime necessity where a water supply has been introduced. The comparatively small cost of the separate system of sewerage places it within the power of almost every village to have thorough sewerage and sub-soil drainage where they have a proper water supply. Many towns are now suffering most seriously from the neglect of sewerage and drainage.

In many cases it is the costliness of sewerage on the old plan which deters the people from the construction of the necessary works. Far greater progress in the matters of sewerage would, we believe, be made if the public were thoroughly informed of the comparatively small cost at which pipe sewers with thorough flushing arrangements can be laid down. Sewers whose cost will not only be less than that of the large brick structures by fifty or seventy per cent, but which will be far more healthful in their working.

The law creating the new aqueduct board for the supply of the city of New York with water has laid upon this State Board of Health the obligation to establish sanitary regulations for reservoirs, constructed or maintained in Westchester county under the provision of the act. The problems presented in connection with such regulations are, some of them, intricate and difficult of solution, requiring very careful research and mature consideration before any action is taken in the matter. The drainage committee having the matter in charge have examined the ground and the plans of the chief engineer of the new aqueduct commission. The committee are carrying on such investigations as are necessary before any action can be taken by the State Board. The committee have as yet made no report.

The whole question of water supplies for cities is treated in the report on the Tonawanda swamp, where will be found a most important and valuable collection of tables and facts, which are the result of several months' most diligent and critical scientific investigation on the part of the State Survey. They bring out clearly and approximately measure the influences which control the water supplies of our cities, manufacturing streams and channels of commerce, forming one of the most important contributions which has ever been made to the hydrography of the State of New York. Many questions are suggested by this report which have such important bearing upon the preservation of water supplies, that this Board intends to request the State Survey to further continue investigations as to the climate and hydrography of the State in its sanitary aspects.

The report on the Tonawanda swamp shows the controlling causes and conditions of these great waste tracts, to be extended over such areas and proves so conclusively the interdependence of many towns and several counties, as respects the drainage of the swamp, that further legislation seems necessary in order to enable the localities interested to combine and successfully execute such measures as are clearly required to reclaim the swamp tracts, and relieve the region of their noxious influence.

The Board has under consideration the question of what further legislation is needed to insure successful co-operation on the part of the

localities interested in the execution of extensive drainage works. No conclusions have as yet been reached.

The detailed reports and recommendations of the Committee on Drainage and Topography are the result of the most active and rigorous investigations, and the facts contained in them will be found worthy of careful study by all citizens interested in the preservation of public health.

THE LUNG PLAGUE IN CATTLE.

The attention of this Board has been called to this disease, cases of which have recently been reported to this Board in two of the rural districts of the State. There can doubtless be no impropriety in the reference of the matter to this office, for even if limited to the bovine race and not directly transmissible to man, it is a preventable contagious disease toward the management of which the machinery of the Health Boards of the State may easily be directed, and aside from the pecuniary interest involved, it affects a source of food of the highest importance, and one which, by this affection, may prove to be a source of disease to human beings.

Information was accordingly sought from Professor James Law, of Cornell University, whose familiarity with the subject is well known, and the following report has been received from him, regarding the nature and distribution of the disease and propositions for its eradication.

REFERENCES FROM GOVERNOR.

Under the provisions of section 8 of the amended Health Act, the Board has received several orders to investigate sources of alleged nuisances. Chief among these has been a petition from some two hundred and sixteen citizens praying for relief against a nuisance caused by the processes of manufacture in the Glen Cove Starch Works on Long Island.

The petition was referred by the Board to the Committee on Effluvium Nuisances for examination and report.

After careful examination of the complaint, and the taking of evidence from those who accused the starch factory as the producers of this nuisance, as well as from those who exonerated them from blame, the committee made a careful inspection of the locality, the works themselves, and the processes of manufacture. The results of their labor, with the testimony of the experts engaged in the examination of refuse materials, the waste products emptied into the waters of the bay, will be found in their completed report, which, with the conclusions arrived at, and the recommended methods for their removal, is to be found in the Appendix.

Stench Nuisances.

As will be seen from the report of the special committee, the warfare upon this class of nuisances has continued unabated. Great difficulties were encountered in subduing or in removing the nearly one hundred offensive business establishments and sources of stench nuisances in the Newtown creek district of Kings and Queens counties.

The seventy-six orders which were served under Governor Cornell's administration, and the thirty-four, even more exacting, served by Governor Cleveland, upon the recommendation of this Board, and the State maintenance of inspection service by a skilled and trained inspector during the past twelve months, and for a year previously, to maintain executive authority in that district as faithfully as possible, are in evidence of an earnest desire and endeavor to secure the abatement of this long line of nuisances.

The sheriff of Queens county finally shut up several of the obdurate offenders' places, and wholly destroyed the apparatus and stock of one of the most persistent.

The unapproachable stupidity of certain persons engaged in stench-making trades is now the chief obstacle to the complete abatement of this class of nuisances in the above counties.

The health department of Brooklyn took in hand fifty-one places in the Creek and Bushwick district; and subdued as many as the city court would permit, that court having power to reverse any decisions of the health department within ten days of any order.

In Queens county the local authorities encouraged, rather than discouraged, the continuance of every nuisance that had been attacked; yet thirty out of thirty-four, which received Governor Cleveland's orders, have been abated and controlled, and nearly all those upon which Governor Cornell laid orders are removed or reasonably repressed.

The petroleum stench remains more or less noticeable at times. It is now controlled as far as the Standard Oil Syndicate Government can bring its authority to bear, but volatile emanations are in a certain degree unavoidably associated with every movement and exposure of the petroleum.

It is safe to say, however, that more than nine-tenths of the total amount of offensive effluvia which tortured the passengers upon the Long Island railways, in the Newtown creek region, and the inhabitants of the eighteenth, nineteenth and twenty-first wards of New York, are abated, and their sources successfully controlled.

A skilled inspector is kept on duty at the expense of the State, and will continue to be for a year to come, to repress effluvium nuisances in the stench district; and as there are in that district fourteen refineries

of petroleum, and nearly all the factories which are devoted to the utilization of waste and refuse materials of the metropolitan cities and their two millions of inhabitants, this task is difficult.

Adulteration of Food and Drugs.

In its second annual report, the Board presented the outline of the organization of the Bureau of Chemical Analysts, appointed in compliance with the provisions of chapter 407, of 1881; its mode of administering the law, and some of the results first obtained. Eight chemists and examiners were engaged in the Board's service at a definite rate of compensation, and to each was allotted that branch of the work for which he was most fitted by previous chemical study. Two expert inspectors were also employed to gather samples for analysis and ascertain such facts regarding them as the Board might need to know in its future action. A third inspector was subsequently added to the corps.

The analysts did excellent work in their respective departments, enabling the Board to address itself to what was regarded as the first essential in the discharge of this important public duty, namely, ascertaining the character of the food and drug supply then in the market. The State was pretty thoroughly canvassed; samples of the various articles of foods and drugs found, purchased and analyzed, and the ascertained facts in connection therewith published, giving in over two hundred closely printed pages a body of information clearly exhibiting the extent, character and harmful qualities of the adulterations practiced. Records were kept of the circumstances, time and place of each article purchased that in the event of a subsequent prosecution for violation of the law, no weakness might be discoverable in the chain of evidence necessary to obtain conviction. Thus far, in this preliminary work, the Board has encountered no serious obstacle: and a system has been perfected by which any article suspected of adulteration can be purchased and analyzed.

It was manifest, however, from the beginning that the purposes of this just and comprehensive law would not be secured by any mere detection of fraudulent practices. The protection of the public and the encouragement of honorable dealers, required the prosecution and punishment of the offender; and just here is where the difficulty has been encountered.

The Board early found that it would be perilous to entrust to ordinary district attorneys the prosecution of offenses of this character at least till such time as the law was sufficiently understood and respected to inspire a wholesome restraint against its infraction, and that the aid of special counsel familiar with such cases was essential to secure indictment by jury, prevent delay in bringing it to trial and insure conviction. Such work would of necessity be costly ; for arrayed against

the Board would inevitably be the power of capital, and that legal and chemical talent which capital only can command. Hence, the success of the Board in this part of the work has been limited, and the lack of funds has prevented it from assuming an aggressive attitude. Several cases have been prepared and put into the hands of district attorneys, but the chances of success are quite problematical. The details of the work of the Board in this department will be found in the Appendix.

The farming classes whose interest is most directly jeoparded by the sale of adulterated and artificial butter and cheese are naturally enough loudest in their complaints, and demand protection for their industry against the spurious articles now illegally placed on the market. Their position is quite tenable and their request reasonable and should have respectful consideration. They do not insist upon the stoppage of the manufacture of artificial butter and cheese; but ask that, if sold, it shall be sold for what it is, and that such commercial fair dealing shall be made a requirement of law as will render it a misdemeanor to sell butterine for butter, or lard cheese for cheese made from the whole milk of cows. The law, however, is already sufficiently comprehensive to include this obligation; the means for its enforcement alone are lacking.

At present the Board numbers among its analysts four chemists of undoubted standing representing the four geographical divisions into which the State has been divided for the purpose, who with their laboratories are at all times at the service of the State.

Special attention has been given to the adulteration of milk, and upon request two inspectors connected with the New York City Board of Health and one connected with the Brooklyn City Board have been appointed State Inspectors, to serve without pay and with no authority to destroy property. Interesting reports of their work will be found in the Appendix.

Illuminating Oils.— This subject and the work accomplished during the past year will be studied with interest in report of the Sanitary Committee in the Appendix.

Respectfully submitted, by order of the Board,

EDWARD M. MOORE, *President*,
ERASTUS BROOKS,
WM. M. SMITH,
LESLIE W. RUSSELL,
J. SAVAGE DELAVAN,
JAMES G. HUNT,
JAMES T. GARDINER.

OFFICE OF THE BOARD OF HEALTH, ALBANY, *Feb.* 21, 1884.

[Assem. Doc. No. 89.] 4

APPENDIX.

REPORT

OF EXECUTIVE AND FINANCE COMMITTEE FOR FISCAL YEAR ENDING SEPTEMBER 30, 1883.

Traveling and other Necessary Expenses of Members.

1882.			
Oct.	4.	Dr. J. Savage Delavan, per account.....	$9 00
1883.			
Jan.	2.	Dr. James G. Hunt, per account	38 28
	24.	Prof. Charles F. Chandler, per account.....	98 77
Feb.	13.	Dr. William M. Smith, per account.....	29 35
March	6.	Dr. J. Savage Delavan, per account.....	11 70
	27.	Dr. Edward M. Moore, per account.....	37 19
April	4.	Dr. J. Savage Delavan, per account.....	19 57
May	3.	Dr. J. Savage Delavan, per account.....	16 85
	14.	Erastus Brooks, per account..... ...	34 60
July	14.	Dr. J. Savage Delavan, per account.....	18 30
		Dr. J. Savage Delavan, per account.....	50 00
Aug.	11.	Prof. Charles F. Chandler, per account.....	19 80
			$383 41

Salaries and Wages.

1882.			
Nov.	1.	Dr. Elisha Harris, secretary, for October	$250 00
		Frederick Carman, stenographer and correspondence clerk.....	150 00
		Robert Nelson, registry and account clerk....	125 00
		Dr. George F. Brooks, mortality registry clerk,	100 00
		Fergus Halpen, office boy and messenger.....	18 00
		Peter Halpen, asst. office boy and messenger..	7 25
Dec.	1.	Dr Elisha Harris, secretary, for November ...	250 00
		Frederick Carman, stenographer and correspondence clerk.....	150 00
		Robert Nelson, registry and account clerk....	125 00
		Dr. George F. Brooks, mortality registry clerk,	100 00
		B. M. Gallien, birth registry clerk	100 00
		Fergus Halpen, office boy and messenger.....	18 00

1882.			
Dec.	22.	Dr. Elisha Harris, secretary, for December....	$250 00
		Frederick Carman, stenographer and correspondence clerk.....	150 00
		Robert Nelson, registry and account clerk....	125 00
		Dr. George F. Brooks, mortality registry clerk,	100 00
		B. M. Gallien, birth registry clerk	100 00
		Fergus Halpen, office boy and messenger.....	18 00
1883.			
Feb.	1.	Dr. Elisha Harris, secretary, for January	250 00
		Frederick Carman, stenographer and correspondence clerk.....	150 00
		Robert Nelson, registry and account clerk....	125 00
		Dr. George F. Brooks, mortality registry clerk,	112 50
		B. M. Gallien, birth registry clerk.....	100 00
		Fergus Halpen, office boy and messenger.....	18 00
March	1.	Dr. Elisha Harris, secretary	250 00
		Frederick Carman, correspondence clerk and stenographer	150 00
		Robert Nelson, registry and account clerk....	125 00
		Dr. George F. Brooks, mortality registry clerk.	112 50
		B. M. Gallien, birth registry clerk.....	100 00
		Fergus Halpen, office boy and messenger.....	18 00
April	1.	Dr. Elisha Harris, secretary	250 00
		Frederick Carman, correspondence clerk and stenographer.....	150 00
		Robert Nelson, registry and account clerk....	125 00
		Dr. George F. Brooks, mortality registry clerk.	112 50
		B. M. Gallien, birth registry clerk.....	100 00
		Fergus Halpen, office boy and messenger.....	18 00
		Peter Halpen, asst. office boy and messenger..	10 00
May	1.	Dr. Elisha Harris, secretary	250 00
		Frederick Carman, stenographer and correspondence clerk.....	150 00
		Robert Nelson, registry and account clerk ...	125 00
		Dr. George F. Brooks, mortality registry clerk.	112 50
		Fergus Halpen, office boy and messenger.....	18 00
June	1.	Dr. Elisha Harris, secretary	250 00
		Frederick Carman, stenographer and correspondence clerk.....	150 00
		Robert Nelson, registry and account clerk	125 00
		Dr. George F. Brooks, mortality registry clerk.	112 50
		B. M. Gallien, birth registry clerk.....	
		Fergus Halpen, office boy and messenger.....	18 00
July	1.	Dr. Elisha Harris, secretary	250 00
		Frederick Carman, stenographer and correspondence clerk.....	150 00
		Robert Nelson, registry and account clerk....	125 00
		Dr. George F. Brooks, mortality registry clerk.	125 00
		Fergus Halpen, office boy and messenger	18 00
Aug.	1.	Dr. Elisha Harris, secretary	250 00
		Frederick Carman, stenographer and correspondence clerk.....	150 00

1883.			
Aug.	1.	Robert Nelson, registry and account clerk	$125 00
		Dr. George F. Brooks, mortality registry clerk.	125 00
		Dr. F. C. Curtis.....	150 00
		Fergus Halpen, office boy and messenger.....	18 00
Sept.	1.	Dr. Elisha Harris, secretary	250 00
		Frederick Carman, stenographer and correspondence clerk.....	150 00
		Robert Nelson, registry and account clerk....	125 00
		Dr. George F. Brooks, mortality registry clerk.	125 00
		Dr. F. C. Curtis.....	150 00
		Fergus Halpen, office boy and messenger.....	18 00
Oct.	1.	Dr. Elisha Harris, secretary	250 00
		Frederick Carman, stenographer and correspondence clerk.....	150 00
		Robert Nelson, registry and account clerk	125 00
		Dr. George F. Brooks, mortality registry clerk.	125 00
		Dr. F. C. Curtis.....	100 00
		Fergus Halpen, office boy and messenger.....	18 00
			$8,764 75

Scientific and Expert Service.

1882.			
Oct.	1.	Emil Kuichling, C. E., services at Schaghticoke and Oneonta.....	$54 50
		Dr. R. V. K. Montfort, inspecting railroad laborers' lodgings.....	25 00
	7.	J. J. R. Croes, C. E., services on Nepperhan nuisance investigation.....	101 35
Nov.	1.	Dr. J. H. Trumbull, emigrant train inspector..	102 92
		Dr. A. L. Perry, emigrant train inspector.....	100 40
		Gavit & Co., for inspector's badge.....	18 00
		Prof. W. G. Tucker, water analysis	40 00
	2.	Albert L. Colby, inspector.....	43 86
	3.	Prof. S. A. Lattimore, water analysis.....	40 00
	3.	Emil Kuichling, C. E., services at Utica, Rome, Oneida, etc.....	70 52
	5.	Prof. S. A. Lattimore, water analysis	10 00
	15.	Dr. A. L. Perry, emigrant train inspector.....	53 48
	17.	Dr. Alfred L. Carroll, medical inspections on Staten Island and Pleasantville.....	41 86
	29.	Dr. A. L. Perry, emigrant train inspector.....	46 87
Dec.	1.	N. L. Colby, inspector	35 24
		Dr. J. H. Trumbull, emigrant train inspector..	101 21
		E. N. Masters, services in connection with investigation of malaria at Schaghticoke....	6 50
		John Downs, for expenses of committee in connection with investigation of malaria at Schaghticoke	6 50
		Dr. W. C. Crombie, services at Schaghticoke...	20 00

1882.			
Dec.	5.	Emil Kuichling, C. E., services at Fort Edward and Geneva	$33 54
	8.	Dr. E. G. Love, analysis of water	10 00
	18.	Charles F. Wingate, sanitary engineer, for services	25 00
	29.	Dr. L. J. Ames, sanitary inspections along Genesee Valley canal	31 45
	30.	A. L. Colby, inspector	33 34
	30.	Dr. F. C. Curtis, 50 slips of vaccine	5 00
	30.	Dr. F. C. Curtis, medical inspections at Little Falls and Madison University	49 75
1883.			
Jan.	3.	Emil Kuichling, C. E., services at Madison University and Geneva	58 05
	3.	W. S. Egerton, C. E., services at Schodack	15 00
	18.	Dr. Frank P. Foster, 130 slips vaccine	13 00
	26.	Dr. Frank P. Foster, 630 slips vaccine	53 00
	31.	Albert L. Colby, inspector	42 63
Feb.	3.	Dr. H. G. V. de Hart, medical inspections at Pleasantville	22 00
	7.	Emil Kuichling, C. E., reports on drainage and sewerage	167 98
	9.	Prof. James Law, D. V. S., services investigating kine pock	40 25
	13.	Dr. H. D. Wey, services investigating winter cholera at Binghamton	29 05
March	5.	Dr. H. W. Purdy, vaccinating passengers on emigrant trains	11 00
	5.	Dr. Frank P. Foster, vaccine furnished various parties	35 10
	6.	Prof Willis G. Tucker, water analysis	31 30
	7.	Emil Kuichling, C. E., services during February, per account	38 82
	13.	Arthur Hollick, services inspecting oil refineries.	63 20
	22.	Albert L. Colby, services inspecting oil refineries	36 24
April	3.	Emil Kuichling, C. E., services during March, per account	31 02
	3.	Dr. J. G. Orton, services investigating winter cholera	91 75
	4.	A. L. Colby, services inspecting oil refineries	44 60
	23.	Dr. H. D. Wey, medical expert, for services at Ithaca and Horseheads	26 42
	2.	Emil Kuichling, C. E., services during April, per account	76 62
	9.	Horace Andrews, drawing map	3 00
May	9.	Arthur Hollick, inspecting oil refineries	11 20
	16.	Albert L. Colby, inspecting oil refineries	50 93
	17.	Dr. W. J. Ransom, medical investigations at Bergholtz	17 51
June	1.	Albert L. Colby, inspecting oil refineries	36 16

1883.

June	7.	Dr. W. J. Ransom, medical investigations of measles	$38 00
	9.	Emil Kuichling, C. E., services in May	61 94
	9.	Arthur Hollick, inspecting nuisances at Newtown creek	26 95
	25.	Dr. Eugene Beach, medical investigations of diphtheria	89 27
July	3.	Emil Kuichling, C. E., services in June	115 25
	12.	Albert L. Colby, inspecting nuisances Newtown creek	82 17
	12.	Arthur Hollick, inspecting nuisances at Hunter's Point	142 95
	19.	Prof. W. G. Tucker, water analysis	20 00
	20.	W. S. Egerton, C. E., services at Bath and Castleton	31 30
Aug.	1.	Emil Kuichling, C. E., services during July, per account	100 23
	4.	Arthur Hollick, inspecting nuisances in Queens county	114 40
Sept.	11.	Arthur Hollick, inspecting nuisances in Kings and Queens counties	75 90
	11.	Dr. E. G. Love, expenses incurred while attending meetings for conference of chemists at Albany	7 45
	20.	W. S. Egerton, C. E., services at Poughkeepsie,	39 86
Oct.	4.	Arthur Hollick, inspecting nuisances in Queens county	89 00
	4.	Emil Kuichling, C. E., services during September	33 85
	4.	Prof. S. A. Lattimore, water analysis	34 15
	4.	Dr. E. G. Love, analysis of butter	75 00
		Frederick Carman, expenses attending session committee	11 05
			$3,353 02

Postage, Expressage and Telegraphing.

1882.

Nov.	23.	American Express Company	$3 55
		American Express Company	4 10
Dec.	11.	American Express Company	12 85

1883.

Jan.	5.	American Express Company	8 80
Feb.	8.	Erie & New England Express Company	19 10
		National Express Company	2 65
	16.	American Express Company	22 15
March	3.	Erie & New England Express Company	8 35
		National Express Company	1 90
	7.	American Express Company	8 45

1883.			
April	18.	American Express Company	$5 15
		Erie & New England Express Company	7 00
May	3.	Erie & New England Express Company	5 00
		American Express Company	3 25
June	6.	Erie & New England Express	2 20
	7.	American Express	3 85
July	9.	American Express	5 25
Aug.	9.	American Express	5 05
		National Express	2 20
Sept.	12.	American Express	4 70
	30.	American Express	3 75
			$139 30

Printing and Stationery.

1882.			
Oct.	11.	Weed Parsons' account	$129 50
		Van Benthuysen's account	354 45
1883.			
Jan.	18.	Van Benthuysen's account	238 63
Aug.	11.	R. K. Quayle, printing note headings	16 00
		Van Benthuysen's account	351 90
		Weed Parsons' account	306 79
Sept.	30.	Van Benthuysen & Sons' account	329 00
			$1,726 27

Unclassified Payments at Central Office.

1882.			
Nov.	23.	Petty cash per itemized account	$20 46
1883.			
July	12.	Petty cash per itemized account	61 03
			$81 49

Furniture Account.

April	27.	A. M. Michael, two date stamps	$20 00

Library, Maps and Charts.

Sept.	30.	W. C. Little & Co., for books	$19 90
		Total for year ending September 30, 1883	$14,488 14
		Balance unexpended	$8,585 43

REPORT

OF THE COMMITTEE ON REGISTRATION AND VITAL STATISTICS.

The work in this branch of the Board's duties during the past year has steadily progressed. The organization of local boards in towns and villages has been carefully fostered, entailing unavoidably a large correspondence.

The Board at its meeting at Ogdensburg passed the following resolutions :

"WHEREAS, In sparsely settled regions of the State, and especially among ignorant classes of people, the records of death, particularly of aged persons and infants, are in many instances neglected ; and

"WHEREAS, Births and marriages in such localities are very liable to be unrecorded unless special efforts and provisions are made to insure the official registration required by law ; and as birth registry is specially liable to be neglected in cases where no professional attendants can be held responsible, therefore,

"*Resolved*, That it is deemed necessary that every town clerk in this State should carefully instruct, and enter upon stated communications with all school district clerks within the jurisdiction of his registry service, for the purpose of securing perfect records of birth and marriage, as well as of death, the records of which might otherwise fail to be obtained, and that to this end the town board should pay a moderate fee, as authorized by law, to the school district clerks, such compensation to be included as a part of the total fee allowed for the registry of the complete record.

"*Resolved*, That the methods and compensation recommended in the foregoing resolution in relation hereto is hereby officially authorized and directed by the State Board of Health, under the provision specified in section 3 of the amended general statute for the preservation of the public health."

A resolution providing for a yearly gathering in of delayed records was also passed, and the secretary issued the following instructions from the central office, which were sent to every local board in the State.

Rules and Forms for Securing Complete and Perfect Returns of Delayed Certificates and Records of Deaths, Births and Marriages.

I. *The delayed certificate of a death.* — Form three, of the series of certificate blanks, must be filled in its first ten lines by some person, or on verbal or written statements, that can best be relied upon for accuracy and completeness in making out the personal records of the decedent, and the signature of said informant or witness should be affixed under the tenth line, or should be authorized, and the name and residence be there written by the registrar or his agent when obtaining such certificate. The medical or other legal attestation of the causes of death should be made by one of the latest medical attendants upon the deceased person ; or by a justice of the peace ;* and if by the latter, the evidence (testimony) on which his attestation of "cause of death" is based should be written briefly and clearly on the blank half of the back of the certificate.† Every such certificate should be submitted to the proper medical officer of the sanitary jurisdiction within which the death occurred. In cities and large villages every certificate must be attested by a physician or competent medical officer.

The local registry officer will inscribe on the right side of the back of every delayed certificate the date of his registration of it.† All such certificates will be filed in the State bureau as others are filed, in the order received, and if satisfactory, will there be registered.

Uncertified deaths. Whenever a death remains wholly uncertified, the law should be enforced concerning such neglect, and the facts should be reported (on the ordinary form of certificate) by the local authorities, to the State bureau. The local registry officer will secure the greatest practicable completeness in such records and in all returns from coroners. Health officers, justices of the peace and coroners are authorized to investigate and certify all facts required in a record for the death registry. Every local board of health has full authority to enforce its rules and regulations concerning the records of deaths and burials.

II. *Delayed return of a birth certificate.* — The local and State regulations require that the professional attendant at a birth shall certify its record and see that it is filed in the office of registration. The certifying and registering of all births which have no medical or other professional attendants are hereby provided for under the following rule :

In every instance in which there is no medical attendant or professional attestant on the birth of an infant, one or both of the parents, or the householder or other custodian of the said infant, shall make and attest the record of the birth in the form of the certificate used in this State, and shall offer the same to the local registry officer.

To collect the delayed records of births. The registry officer will, by methods he prefers, give notice to parents as well as professional attendants, on receiving information of a delayed birth-record, directing the required certificate to be immediately given to him for registration. In addition to this constant duty of the registry officer to the families and physicians, there must be such systematic canvassing and other enumera-

*In the *town* registry a justice of the peace may, when no medical certificate is possible, obtain and attest the record of a death.

†See indorsements on A (imprinted upon the blank section of the back of a death certificate, "No. 3") inclosed.

tion throughout each registry district as shall result in obtaining every delayed record. Whether this is accomplished by help of the school district clerks in towns, or by other means which may be available also in villages and cities, it is a duty to be perfectly completed by February 1, for the calendar year. The form of notice and the rule to be enforced are given on B, a note here inclosed, imprinted upon the back of a birth-record blank.

III. *Delayed returns of marriage records.*—In every case of discovered neglect to report marriage, the husband, as well as the person whose duty it is to attest the marriage and give the certificate, should be notified of the requirement for the attested record at the registry office. The necessity for collecting the delayed marriage certificates is nearly the same as that for the delayed records of births. Though the published regulations call for the returns to the registry officer, the statutes simply require that the certificates shall be duly made and kept, and be given as called for; therefore it becomes necessary to collect all records that are not promptly returned as required by regulations. The form of notice and the rule to be observed are given on C, a form here inclosed. Whatever may cause delay in voluntary returns of marriage certificates, no minister or magistrate can lawfully refuse to give the records when the registry officer asks for them. Until an amended law shall abolish this necessity for constant watchfulness and notification, such a periodical canvassing to prevent delay and neglect in filing certificates for registry will have to be continued.

Compensation. The limit being fixed by the fee of fifty cents for each complete and perfect record, the State Board has approved this as the lawful compensation for collecting and registering this class of records, which are designated as delayed or neglected.

The committee are impressed with the conviction that the law needs specific amendment to make it a duty of all physicians and clergymen to report the births, deaths and marriages they respectively attend to the local registrar of the place. The stationery and whatever postage may be needed to effect this the local board may well provide. The law allows fifty cents to be charged for each complete registered record, a sufficient amount your committee considers to defray all expenses incident to the making out, forwarding and registering of every such certificate. It is further believed, that the interest of correct registration would be promoted by providing a specific compensation for the district clerks of so much per record for the work of collecting them in their respective districts and bringing them to the proper registrar. Nothing in addition to the fifty cents already allowed by law as a registration fee is recommended; but rather a division of this amount, so that all who have to do with the forwarding or recording of either a death, birth or marriage shall be suitably compensated for the trouble imposed.

In addition to inducing local organizations and placing the registration service on a sound footing, the committee has been preparing for periodical exhibits of the condition of the public health of the State.

The most difficult work of the committee, however, and one on which it has bestowed the greatest pains, has been the preparation of the revised nomenclature of the causes of death which has been already published. In the preparation of it the latest revision of the Royal College of Physicians of Great Britain, not yet published, has been followed. This con-

tribution to exactness in nomenclature will be welcomed by the medical profession and will be of valuable assistance to this Board in making the public registration of vital statistics in the State of New York accurate and useful. It will be followed as closely as possible, it is hoped, not only by the registry officers but also by the physicians generally of the State in making their returns of mortality. By this means not only what is to be accepted as the latest and best in nomenclature of the causes of mortality will be secured, but also the great desideratum of our uniform line of selection of terms will be employed out of the often bewildering maze of names and definitions with which medical literature is incumbered.

REPORT

OF THE COMMITTEE ON PUBLIC INSTITUTIONS.

The work under this committee has mainly been in giving advice on questions submitted in the form of correspondence. A few inspections have been made. The principal of these, together with the correspondence that led to it and the reports thereon, is here given :

COBLESKILL, N. Y., *December* 19, 1882.

Hon. Dr. ELISHA HARRIS, *Secretary State Board of Health:*

DEAR SIR — The board of education of this village would respectfully ask that a representative of your Board be commissioned to inspect and report upon the site now occupied by our union school building.

This request is made for reasons, as follows:

First. The demand for a new school building is imperative.

Second. The present is, as we believe, unhealthful and unfit for a school site, because located within fifty-four feet of one hotel yard, sheds and stables and 120 feet of another hotel yard, sheds and stables, and the present site is continually subjected to the bad air therefrom, and in one are kept and bred a number of swine.

Third. The drainage of a number of houses reaches the surface immediately in front of the present school building.

Fourth. In view of the past and reasonably expected future growth of our village, the present site is far too small in area for the accommodation and healthful exercise of the children.

Deeming all that relates to the best interests of our school of permanent importance, it is earnestly asked that the request herein embodied be granted at the earliest moment convenient to your honorable Board.

Yours respectfully,

CHAS. H. SHAVER,

President, Board of Education.

Having examined the school site and building and found them as described in the above report, I heartily concur with the request of the president of the board of education.

C. D. WELCH, M. D.,

Health Officer, Cobleskill.

In response to the above a medical investigator and a sanitary engineer were sent to Cobleskill, who reported as follows:

ALBANY, *January* 4, 1883.

ELISHA HARRIS, M. D., *Secretary of the State Board of Health:*

DEAR SIR — Agreeably with your request I visited yesterday, in company with Prof. Richard Prescott, sanitary engineer, the village of Cobleskill to consult with the local board of education of that village, in response to whose request the visit was ordered, in regard to a school site.

Cobleskill is a thriving village of about 2,000 people, in the county of Schoharie, on the Susquehanna railroad, maintained by the traffic of a considerable and rich outlying region, of which it is the emporium. It has several large hotels, well patronized by summer visitors. These and numerous stores along its principal street, Main street, give it a thrifty appearance. The large part of the residence portion of the village is located to the north of this street, which has almost a due east and west course. A good part of it lies upon a level space of limited area; to the north one or two streets ascend the side of a considerable range of hill, and it is toward this direction that the growth of the village is being made.

In company with the school board, the school commissioner and two local physicians, one being the health officer of the town, we visited the present school building. It is located on the corner of Union and Lark streets near the center of the village, and the length of a block distant from the main street at its busiest point. The edifice is two stories high, of brick, not far from the center of the lot. It was constructed twelve years ago, but is in such a state of disrepair as to be condemned as utterly unfit and dangerous for occupancy. The details of the structure I will leave for my colleague to report. On the first floor, in a room about 40 by 45 feet, about 140 small children are huddled. Being the beginning of the term hardly half of this number were present, but the air was quite offensive. It is heated by two stoves, very unevenly, and cold air pours in around very bad doors and through window cracks, forming strong and dangerous draughts upon those near, while those about the stove are superheated. In a small recitation-room, communicating, about 12 by 15 feet, forty children are often collected. On the second floor are two large rooms, one being for scholars of academic grades coming largely from the surrounding country. The conditions are similar to those below. In addition to defective doors and windows, absence of any safe ventilation, very faulty methods of heating, the building is in semi-ruinous disrepair, with broken plaster and one of the walls bulging markedly out of line, no principle of school hygiene, such as the proper direction of light, suitable desks and seats and the like are attended to, and altogether the building is a disgrace to a thriving village of intelligent people. This may be said with the more assurance as it is the opinion of the villagers generally, there appearing to be but few who think the building good enough or capable of repair, even.

I made inquiry of the teachers and the physicians as to sickness among the children, which might reasonably be looked for. There appear to have been no contagious diseases prevalent. There were not gathered any facts pointing to any special variety of disease in these

overcrowded rooms. A good many are constantly absent on sick excuse ; their ailments are colds, sore throat and headache. The children present many of them looked rather pale.

The lot upon which the school stands is 300 feet by 187 feet (6,232 square yards in size). There is but little room for play ground. A well is near the building, and forty feet away is a single privy, with two apartments for the sexes, a condition quite disconsonant with propriety for such a school. Along one side of the lot, fifty feet from the building, are horse-sheds of a stable connected with a hotel. Across the street, 120 feet distant, are the sheds and stable yards and pig-styes of another hotel. Both of these are breeding places for horses kept here and also for swine, the demoralization possible on proximity to these being complained of. Bad air and smells from these are said to exist in the warm weather ; they were not offensive as we saw them on account of the cold weather. In front of the school, opposite, is a street ditch where it is said drainage from a hotel and several houses comes to the surface. This at least is given in explanation of an offensive odor reported as appearing here. The limited size of this lot for an increasing number of children, the steady encroachment of the business part of the village about it, the unsanitary surrounding conditions noted, and the demoralization and debasing character of the surroundings, which promise no prospect of amelioration but rather the converse, altogether lead me to the conclusion that it is a very bad site for a school-house and for the erection of a *new* one, especially in a village which offers possibilities for greatly better and vastly more appropriate localities for this high purpose; this site should in my judgment be utterly condemned.

The proposed new site, to which we were taken, seems in every way suitable. While at present a little remote from the center of the village it is not more than a five minutes' walk from the old one, and being in the direction of growth of dwellings will be in a few years more central. It is on the slope of hill-side north of the village, and fifty or sixty feet above the level noted. Part way up this slope, on a southern exposure, three acres are to be taken on a somewhat level area. The soil is a gravelly loam mixed with yellow clay and small boulders. It is well drained. The slope in front descends abruptly. A lovely view is commanded of the Cobleskill valley and its surrounding hills and a large part of the business portion of the pretty village. Drained in all directions except at the rear, with free circulation of air, with possibilities for ready disposal of waste, being a sightly locality though not inaccessible readily, a good school edifice constructed there would be healthful to its occupants, and an ornament of a most worthy sort to this village.

It was ascertained that the local board of instruction, the board of village trustees and a large part of the influential citizens favored the change. Several of the latter with whom we held a conference expressed themselves to this effect.

The old or present building must go. The present site should follow, on sanitary grounds ; and the proposed site is in every way worthy. My colleague and myself unite in this opinion, and we commend respectfully to the State Board of Health that its advice so accord, as consonant with the best sanitary conditions, concerning which its advice and weighty influence is solicited.

Respectfully yours,

F. C. CURTIS,

Sanitary Investigator.

ALBANY, *January* 4, 1884.

TO DR. ELISHA HARRIS, *Secretary State Board of Health, Albany, N. Y.*

DEAR SIR — In accordance with your request dated 29th of December, 1883, I visited Cobleskill, N. Y., yesterday with Prof. F. C. Curtis, M. D., and inspected the Cobleskill Union Free School, the school site and the proposed site for a new building, and now beg leave to submit the following report :

A. SCHOOL BUILDING.

The building is a brick structure, two stories in height, with a cellar beneath; is in a dilapidated condition, the side walls bulging dangerously, the wood work inside badly sprung, and chimneys partly destroyed. The building was erected about fifteen years ago, and fell down, partly, just before completion. In repairing, a number of iron tie rods and anchors were used, upon which the stability of the structure is now dependent.

The rooms are heated by stoves, eight in all, with the common result of very unequal distribution of heat. The floors are uniformly cold, as are those parts of the room remote from the stove, while in the immediate vicinity of the stoves — some pupils sit within three feet — the heat is intense.

No attempt at ventilation is made in any room and consequently the air is extremely impure, the odor in the primary department being almost unbearable. The rooms are lighted from two adjacent sides, and have rather more than one-half the proper amount of glass surface.

All of the rooms are overcrowded. In the primary department, measuring 37½ feet by 44 feet, there are 180 pupils, giving 9.1 square feet floor surface to each pupil. In each of the two recitation-rooms belonging to this department, forty pupils occupy a floor measuring 12 feet by 15 feet, giving 4.5 square feet per pupil. In the academic and intermediate departments the floor space per pupil is 12.1 square feet. The rooms are 10 feet high, giving in the primary room 91 cubic feet, in primary recitation-room 45 cubic feet, and in academic and intermediate rooms 121 cubic feet per pupil.

B. SCHOOL SITE.

The building is situated 50 feet from a large horse stable and barn, where, during a part of the year, breeding operations are carried on, and 125 feet from the Hotel Augustan, stables, barns and sheds, and a swine yard and shelter. Between these last-mentioned buildings and the school, and about 100 feet from the school, the contents of a drain break through the surface and flow along the gutter. About 45 feet by 50 feet from the school is a large frame privy, resting on stone foundation, having a partition dividing it into two compartments used by the two sexes respectively. There is no vault, the excrement being received in the space between ground and floor. The ground, however, is paved with flag stones to facilitate removal of soil. The well is between 35 feet and 40 feet from the privy, and is occasionally used as a source of drinking water by the pupils. The stables referred to lie to the west

and south of the school, hence winds blowing from these points, or from points between, carry the strong ammoniacal odors directly to the school. The prevailing wind is west.

C. Proposed Site for New Building.

The site proposed for a new building by the board of public instruction is a plat of about three acres, lying on a side hill near the edge of the village (though in the direction of its growth) and of a coarse loamy soil. The particular part of this plat set apart for the building has a very gentle slope, while directly in front and directly behind the slope is steep. This will render necessary the exercise of considerable care in constructing the foundation walls, if the site should be selected and a building erected thereon.

The site affords ample opportunity for disposing of drainage by intermittent sub-soil irrigation, if water should be used in the building.

The site commands a noble outlook, and in its almost absolute freedom from unsanitary environment, presents a marked contrast to that of the present building. It was stated that the stench from a certain slaughter-house would be noticed at the site during prevalence of south-east winds, but as all parts of the village are similarly affected, according to the wind, and also as the south-east winds are infrequent, this objection loses much of its force.

D. Conclusions.

The present building is wholly unfit for school use, and in and of itself dangerous to the health and destructive of the comfort of pupils and teachers. It is not possible to repair or enlarge it without taking the walls down to the foundation, and not very much of the old material could be used in a new building. It is strongly condemned.

The site of the present building presents features unfavorable to health and morals. Some of these features are necessary evils—that is, are essential adjuncts of the site — while others may be removed or bettered. Thus as long as the site is retained the pupils must breathe air contaminated by the neighboring stables and pig-stys, and must be made more or less acquainted with the details of horse-breeding. Beside these conditions, a school on this site must forever appear to be located in a back yard. These are fixed conditions. I regard them as very serious objections to retaining the present site, and of sufficient weight to warrant the State Board of Health to condemn the location as unfit for school purposes.

As has been intimated, the new site proposed by the board of public instruction meets with my approval in general. It is evidently the best available plat of ground in the village.

In conclusion, I have to state that my colleagues and myself endeavored to gain the opinions of parties opposed to condemning the school building, or the school site, or who had objections to the proposed site, but were unsuccessful. Public sentiment was strongly in favor of a new school on a new site.

All of which is respectfully submitted.

RICHARD PRESCOTT, M. E.,
Sanitary Engineer.

Having carefully considered each point in the foregoing statement, the undersigned fully coincide in the conclusions and suggestions of Prof. Prescott.

(Signed.) JAMES G. HUNT, *Chairman.*
E. M. MOORE,
J. SAVAGE DELAVAN,
ELISHA HARRIS.
Standing Committee on Public Institutions.
(Acting with full authority of the Board.)

Albany, *January* 7, 1884.

The undersigned, on behalf of the State Board of Health, respectfully transmit to the board of education of Cobleskill, Schoharie county, the annexed reports as made to this Board by Dr. F. C. Curtis and Prof. Richard Prescott of Albany, who inspected the premises herein referred to, as officially requested by the president of said school board and directed by the president and secretary of the State Board.

With these trustworthy reports the following facts and suggestions are submitted:

1. The present public school-house is justly and for abundant reasons declared to be unfit and dangerous to be occupied as a school building. It is so unfit and unsafe that it should be officially condemned by the local commissioner of schools as well as by the board of education.

2. The unfitness and a certain insalubrity, present and future, of the site of the present school-house should be made generally known among the families which send children to that school, and as soon as the public mind is rightly prepared for a popular and lawful vote on the questions, first, of a new structure, and second, of a change of location and the selection of a healthful and most suitable site, such lawful authorization should be secured.

3. The ground area for the proposed new school structures and premises, for 450 pupils and upwards, should not be less than three acres; and such ground should be thoroughly underdrained and all outflow and sewage matters from the school and premises should be skillfully conducted entirely away from said area of three acres and upwards.

4. The best building site having been selected the school authorities should not fail to devise and adopt the very best plans for giving the greatest possible safeguards to health and life of the pupils and teachers in the architecture and outfitting of all the school-rooms, and of the building and its accessories as a whole.

5. As the present school-house is perilous to the health of all pupils in the primary department, as shown by the reports here annexed and well known to the board of education and the health officer of Cobleskill, the overcrowding and bad ventilation of these departments certainly should be overcome without delay.

Respectfully submitted to the local board of education with the recommendation that prompt, judicious and effectual action be taken by it and the voters who should authorize the work.

E. M. MOORE,
President.

Elisha Harris, *Secretary.*

REPORT ON THE DRAINAGE

OF THE

TONAWANDA AND OAK-ORCHARD SWAMPS.

CORRESPONDENCE.

SENATE CHAMBER, ALBANY,
April 7, 1883.

To the State Board of Health:

GENTLEMEN: — The undersigned, Senators, representing the twenty-ninth, thirtieth, thirty-first and twenty-seventh senatorial districts, deem it a duty to their constituents, to request that the State Board of Health shall, during the ensuing months of the present year, so investigate the sanitary necessity which is believed to exist for the systematic drainage of certain extensive swampy and miasmatic areas pertaining to the water-sheds of the Tonawanda, Oak-Orchard, and Black Creek region, in the counties of Orleans, Niagara, Genesee, Monroe, Erie and Wyoming, that they may be able to report in the month of January next, to the Legislature of this State, what necessity for such drainage they find to exist, and by what means such a system of drainage can best be effected.

EDMUND L. PITTS,
T. E. ELLSWORTH,
SUMNER BALDWIN,
ROBERT C. TITUS.

April 7.

TO JAMES T. GARDINER, C. E., *Director of State Survey:*

DEAR SIR — On behalf of the State Board of Health, I beg leave to inform you that the Senators from the twenty-seventh, twenty-ninth, thirtieth and thirty-first senatorial districts have, by a written memorial, urgently requested this Board to "so investigate the sanitary necessity, which is believed to exist, for the systematic drainage of certain extensive swampy and miasmatic areas pertaining to the watersheds of the Tonawanda, Oak-Orchard and Black Creek regions," comprised within their respective senatorial districts, that the Board may be able to report in January next, to the Legislature, in regard to the necessity and means for a systematic drainage of that part of the State. In view of this memorial from the Senators, and with some definite information now in the Board's possession, it becomes

a duty to request that you, sir, and the Commission whose active service you represent, may arrange that the work of the State Survey shall be immediately extended into the counties of Orleans, Niagara, Erie, Genesee, and the northern border of Wyoming, for the purpose of preparing a topographical map of that region, as an essential basis of whatever plan, or report upon a plan, for sanitary drainage will be worthy of the State and this Board.

As only nine months remain for preparing a report, this Board respectfully asks an early and favorable reply from you; for a suitable report cannot be prepared as a basis for correct legislation, unless accompanied and illustrated by such topographical outline or map as your department of the public service alone can supply, and such detached or special surveys as at certain points will be necessary for descriptive purposes.

Respectfully yours,

E. M. MOORE, *President.*

Elisha Harris, *Secretary.*

Albany, *April* 8, 1883.

To Elisha Harris, M. D., *Secretary State Board of Health.*

Dear Sir — I have the honor to acknowledge the receipt of your request that the work of the State Survey should be immediately extended into the counties of Orleans, Niagara, Erie, Genesee and Wyoming, in order that the map of that part of the State should be completed at once, for the purpose of making a general plan for the sanitary drainage of the extensive swamps of the region.

The triangulation of the State Survey has progressed so far westward that work can be immediately begun in Orleans county. The reasons which you present for a rapid prosecution of the State Survey work in this region are so strong that I feel warranted in transferring one or more of our parties from sections of the State where the demand for the map is not so imperative, to this district where, as I understand you, there is widespread suffering, for the relief of which the survey is a necessary step.

The work shall be begun as soon as the frost is out of the ground, and be pushed forward as rapidly as possible through the above-named counties.

Very respectfully yours,

JAMES T. GARDINER,

Director N. Y. State Survey.

April 10, 1883.

To Hon. Edward L. Pitts, *Senator:*

Dear Sir — I have the honor to acknowledge the reception of the request made to the State Board of Health for such a report upon the necessity and conditions for systematic sanitary drainage of the extensive swamp areas lying within the senatorial districts represented by yourself and the three other Senators who have united in this request. I am warranted in replying, on behalf of this Board, that, under the rules, your request has been referred to its standing committee which has this class of matters in charge, namely, the committee on drainage, sewerage and topography.

This Board through its committee which, under rules, acts with the full authority of the Board, will promptly take action upon this subject. The Board has already acquired important information concerning the regions mentioned in your request, having, during the past two years, caused such examinations of portions of it to be made as have conclusively shown that it will be necessary to secure as a basis for any adequate plans and propositions for successful drainage *an accurate topographical map.*

For this reason, sir, the Board has immediately requested the director of the State Survey to extend his work into, and throughout this locality as early as possible, and he has replied that such work shall be so extended as soon as the frost is out of the ground, beginning from points already established near the villages of Holly and Albion.

I inclose the reply of the director of the State Survey to the request made by this Board.

Respectfully,

E. M. MOORE,
President.

Elisha Harris, *Secretary.*

REPORT.

At a meeting of the State Board of Health, held February 20, 1884, the committee presented the following report on the drainage of the Tonawanda and Oak-Orchard swamp, and, on motion, the report was adopted and ordered presented to the Legislature:

BOSTON MED. LIBRARY ASS. JUL 20 1888

REPORT ON THE DRAINAGE OF THE TONAWANDA AND OAK-ORCHARD SWAMPS.

To the State Board of Health:

On the 7th of April last, the Senators of the twenty-ninth, thirtieth, thirty-first and twenty-seventh senatorial districts, Honorables Edmund L. Pitts, T. E. Ellsworth, Sumner Baldwin and Robert C. Titus, sent to the State Board of Health a request that they would "investigate the sanitary necessity which is believed to exist for systematic drainage for certain extensive swampy and miasmatic areas pertaining to the water-sheds of the Tonawanda, Oak-Orchard and Black Creek regions in the counties of Orleans, Niagara, Genesee, Monroe, Erie and Wyoming; and report in the month of January, 1884, to the Legislature of the State what necessity for such drainage they find to exist and by what means such systematic drainage can best be effected."

The Board responded to this request through its secretary by informing Senator Pitts and his colleagues that the necessary examinations and such plans as the facts of the case shall require would be reported to the next Legislature in accordance with their desire.

The subject was referred to the committee on drainage, sewerage and topography, who were given all necessary powers in the premises.

The State Board of Health finding that the maps of this region were not sufficiently accurate, either for the study of the grounds or the planning of drainage works, requested the State Survey to extend their secondary triangulation over this area and establish a system of datum points which should furnish a correct basis for the local surveys that would be needed.

The commissioners of the State Survey considered the matter at their next meeting and informed the State Board of Health that the necessary work should be done.

Your committee found that in addition to establishing these datum points of the State Survey, which were accurately fixed both in horizontal position and in altitude, it would be necessary to make a number of local and detailed surveys to determine the areas of the swamps referred to, the slopes of their surfaces and the courses of the principal water-channels through them.

These local surveys were authorized by the Board, and have been executed nnder the direction of the committee by Mr. Evershed and Mr. J. W. Holmes.

This committee have also called upon the State Survey for such facts, in connection with the climate of this part of the State, as were needed for a basis for all calculations in respect to the amounts of water liable to be discharged from water-sheds in this region, and at the reqnest of your committee the State Survey has also made the necessary computations for a drainage canal in the valley of Oak-Orchard creek.

The committee desire to express their sense of obligation to the commissioners of the State Survey for the invaluable assistance which has been rendered in response to requests from the Board of Health.

The datum points and levels which have been established by the State Survey, form the basis of the conclusions which the committee has reached in this matter.

REPORT.

The great swamp, formerly known as the Tonawanda swamp, extends in an easterly and westerly direction along the Tonawanda creek, through the north-eastern part of Erie county and the south-eastern part of Niagara county and along Oak-Orchard creek, in the southern part of Orleans and the northern part of Genesee counties. It also touches the head waters of Black creek and passes over on to the east branch of Sandy creek.

The length of the swamp is not less than thirty miles; its breadth seldom more than three miles. Although the swamp was originally one, it is, as we have shown, drained by several streams. In considering the character of this area it was, therefore, desirable to determine whether it was necessary for drainage purposes to divide it into separate basins. An investigation of the ground showed

that the swamp in the neighborhood of Oak-Orchard creek was, in its origin, independent of all other parts, and should be considered separately.

Oak-Orchard creek is the property of the State, owned as a canal feeder. An artificial feeder has been cut across from Tonawanda creek to the natural channel of Oak-Orchard creek in the southern part of the town of Shelby. Your committee found claims were made that Oak-Orchard creek and the artificial feeder from Tonawanda creek were so used as to cause sickness and injury to the people living in the neighborhood of the creek. The swamp lands on Oak-Orchard creek cover an area of some 23,000 acres. On account of the large size of this Oak-Orchard swamp, because Oak-Orchard creek is the property of the State, and because it is alleged that the State is using its property in such a way as to damage the health of the citizens of some six or eight towns, your committee considered it desirable to take up first the investigation of the Oak-Orchard swamp.

The questions pertaining to the swamp lands in the towns of Clarendon and Byron, on Sandy creek and Black creek, are very simple and local compared with those pertaining to the Oak-Orchard creek region; while those relating to the Tonawanda, in Niagara county and Erie county, could not be met until the Oak-Orchard problem was solved. The solution of the questions involved in the Oak-Orchard swamp was, therefore, required before taking up the other swamps.

Oak-Orchard creek begins near the eastern boundary of the town of Elba, and flows almost due westward for some fifteen miles, thence turning a right angle, it runs due north in the town of Shelby and passes through the village of Medina.

The upper part of its course is through the towns of Elba, Oakfield and Alabama, in Genesee county, and the town of Shelby in Orleans county; but it lies close to the boundaries of Clarendon, Byron and Barre. The northward turn of Oak-Orchard creek occurs about a mile south of Coons' bridge, in the town of Shelby. Almost all the water-shed of Oak-Orchard creek lies above Coons' bridge; below that point Oak-Orchard creek is merely an outfall for the waters which have been gathered farther up the stream.

The area drained by Oak-Orchard creek is a great oval basin about seventeen miles long from east to west, and some nine and one-half miles broad in the broadest part. It contains about 88,000 acres, or

a little less than 138 square miles. The edges of this basin are everywhere considerably higher than its center, except at the western end. The bottom of the basin is shaped like a flat trough sloping from the east end downward and westward to Coons' bridge, with an average fall of about one and eight-tenths feet to the mile.

The lowest place in the rim of this basin is at its western end, where the divide between Oak-Orchard creek and the Tonawanda creek is not over three feet above the level of the water in the Oak-Orchard channel; it is here that the Oak-Orchard swamp joins the Tonawanda swamp proper. Although this divide is very low between the waters of the Tonawanda and those of Oak-Orchard, it is nevertheless a real divide, and the waters of the two streams, if given a proper outfall, would never back up and overflow it, except possibly in cases of phenomenal floods.

The low part in the divide between Oak-Orchard and Tonawanda creeks is only about a mile wide, so that building a dyke to keep back the waters of Tonawanda creek from ever overflowing the Oak-Orchard area would be a very simple matter.

On the map accompanying this report, these facts are clearly exhibited, and the levels given in figures which indicate the height above the sea.

The datum referred to is that used by the State Survey, namely, mean-tide at Governor's island, N.Y. The elevations determined by the State Survey show that the bottom of the Oak-Orchard basin near its eastern end is about six hundred and thirty-six to six hundred and thirty-seven feet elevation, while the western end at the bend above Coon's bridge is about six hundred and eleven to six hundred and twelve feet elevation, thus showing a slope of twenty-five to twenty-six feet in the trough-like bottom of the Oak-Orchard basin. Many schemes have been proposed for cutting the rim of the Oak-Orchard basin at some other point than that through which the water naturally empties in the town of Shelby, but the results of the leveling by the State Survey show that the lowest point in the rim or divide at the east end of the Oak-Orchard basin is about six hundred and forty-two feet. This in fact must be considered the elevation of the swamp at its eastern extremity along the boundary line between the towns of Barre and Clarendon. But the swamp itself passes over this divide and runs down the eastern slope into the town of Clarendon.

Along the northern rim of the water-shed the lowest elevations

are at least six hundred and fifty feet, or eighteen feet above the highest point in the bottom of the basin.

For the reason that the lowest point of the rim of the basin is at least ten feet above the highest point of the bottom, and because the bottom slopes from this highest point at the eastern end of the basin down toward the western end with sufficient fall to secure, if the channel were large enough, the rapid flow of water; it must be apparent to all engineers conversant with such matters that the natural and only feasible way of draining this Oak-Orchard basin, is to follow the natural drainage line to its outfall in the town of Shelby.

The bottom of the Oak-Orchard basin is now a swamp through which winds Oak-Orchard creek; the average breadth of this swamp being about two miles. This swamp area is not flat, but on both sides it has a slope toward the creek. Arms of swamp land run up from the main swamp into lateral valleys on the north and south.

The report of the State Survey shows that these lateral swamps lie with such an inclination toward the main channel of Oak-Orchard creek, that they could all be drained if the channel of the Oak-Orchard would give outfall for a sufficient volume of water.

The soil of Oak-Orchard basin is a tough clay. In the swamp it has become overlaid with a coating of muck on which is a thick growth of trees. No rock is found within ten feet of the surface. This muck is from eight inches to a foot deep in the western part of the swamp, but increases to four and five feet thick in the eastern part.

The report of the State Survey, on the rain-fall of this region for the past fifty years, and on the percentage of rain-fall likely to be discharged into the streams of that part of the State lying between Rochester and Buffalo, shows what is the cause of the Oak-Orchard swamp. It appears from the report of the State Survey, that a great deal more water falls upon the water-shed of Oak-Orchard creek, in the months of February, March and April than can possibly be discharged by the Oak-Orchard channel. The water therefore accumulates on the comparatively flat land in the bottom of the basin from which it is slowly drawn off by the creek and by evaporation in the summer.

The cause of the Oak-Orchard swamp is therefore to be found in the fact, that the channel of the creek is not sufficiently large to carry off the waters which fall on the water-shed, in March and

April, together with the accumulated snows which melt during these months. As the water cannot flow off, it accumulates until the warmer part of the season, and then a very large proportion of it is evaporated.

As we have said the surface of the swamp consists very largely of vegetable matter. This is saturated with water during the early part of the year, and later on, it dries out and much of it rapidly decays. Such conditions of oscillating waters and the decay of a large amount of vegetable matter are undoubtedly very injurious to the public health.

The medical testimony furnished us seems to indicate the prevalence of malarial fevers around the whole swamp through the towns of Alabama, Oakfield, Elba and Byron, in Genesee county, and Clarendon, Barre and Shelby in Orleans county. It is impossible to say, however, how far from the borders of the swamp its evil effects are felt.

The character of the soil over the whole water-shed of Oak-Orchard creek is such as to make it very retentive of moisture, so that everywhere over this clayey area the lateral valleys which run down to Oak-Orchard creek are more or less damp, and the vegetation in them is rank.

The experience of this Board and of other boards engaged in sanitary work seems to indicate that where a large swamp exists, which has become a focus of malarial miasmata, these miasms may spread gradually up moist valleys and into moist places which would probably have been free from malarial disease were it not for the central focus of distribution.

While it is not exactly demonstrable, how much effect the existence of the great swamp along Oak-Orchard creek is having on the health of the people who live from three to four miles away, in lateral valleys, it is yet highly probable that the large swamp is exercising an influence on the sanitary condition of the whole of the Oak-Orchard basin.

Just north of Oak-Orchard basin lie the prominent villages of Albion and Medina on the Erie canal. Near its southern side is Batavia on the New York Central and Erie roads. The people of Shelby, Barre, Alabama, Oakfield and Elba are constantly going to and fro over the roads which lead across the Oak-Orchard swamp. They are crossing at night and in the early morn going from their

farms to these market towns at the very hours when their health is most likely to be affected by the miasma of the swamp.

The constant travel of people across this swamp region is quite likely to be exercising serious influence on their health.

Undoubtedly, the people living on the slopes above the swamp and several miles from it, could much improve the health of their localities by thorough under-drainage of all wet spots, and possibly they could thus counteract a part of the evil influence which this swamp must exercise over the surrounding region; but they could not thus prevent the dangers to all those who are, with more or less frequency, crossing and recrossing the great swamp.

Your committee are, therefore, of the opinion that so many people are probably brought under the influence of the miasmatic conditions of this swamp, that it may be said to be injuring the public health of the towns of Shelby, Barre, and Clarendon in Orleans county, and Elba, Oakfield, Alabama and Byron, in Genesee county, and we believe that there would be a general and marked improvement in the healthfulness of a large part of the area of these towns if the swamps in their territories were thoroughly drained.

The investigation of the State Survey into the rain-fall and flow of streams in this part of the State, showing that the swamp is caused by the accumulation in the bottom of Oak-Orchard basin of waters that flow from the whole water-shed, *proves that the drainage of the area cannot be accomplished by any mere local effort.* The only remedy is to *deepen, enlarge and straighten the channel of Oak-Orchard creek*, so as to enable it to discharge *all the water that may fall* on its water-shed through March and April, together with at least twenty inches of snow, which may be accumulated on this area on the 1st of March. For the detailed discussion of this question, we would refer to the State Survey report, a copy of which is appended to this report.

If such an enlargement of the Oak-Orchard creek channel should be made down to Shelby Center in accordance with the report of the State Survey, it appears that during the months of March and April, a rain-fall of eight inches could be carried off, together with twenty inches of melted snow, or its equivalent two inches of rain.

A rain-fall of more than eight inches in March and April has occurred but twice in the last fifty years.

During May and the succeeding months evaporation becomes so great in this region that there is no danger of floods. Even with

the present small channel, Oak-Orchard creek has not been known to overflow its banks in the summer, and only one September flood has occurred during the last twenty years. This was in 1869.

The State Survey has kindly furnished us with the plans for an enlargement and rectification of the channel of Oak-Orchard creek, which, if executed, would undoubtedly by the first of May free the low-lands in the Oak-Orchard basin from all accumulated water, and gradually reduce the sub-soil water in the swamp to a level of some three to four feet below the present water-surface during the season when the lands would be used for agricultural purposes. By reference to these plans, it will be seen that such a channel must be really continuous to near Shelby Center, where the fall of the creek toward the north becomes so rapid as to furnish all necessary outlet for the water-shed of Oak-Orchard swamp.

Oak-Orchard creek would have undoubtedly cut its own channel large and deep enough to thoroughly drain this basin, had it not been for a barrier of hard limestone which crosses at right angles the northerly course of Oak-Orchard creek, between Shelby Center and Coons' bridge. These hard layers of limestone dip to the south with a slope of about forty feet to the mile, and pass far under the Oak-Orchard swamp.

It has been asserted that the swamp lands of Oak-Orchard were increasing in extent and saturation, because of the backing up into Oak-Orchard, of waters brought down by the canal feeder from Tonawanda creek and emptied into the bed of Oak-Orchard creek, a mile south of Coons' bridge. Complaints about this feeder were persistently made for many years, and the State has already expended many thousands of dollars in deepening the feeder between Tonawanda and Oak-Orchard creek. A report by the State Engineer and Surveyor, in 1860, shows that this artificial channel of the feeder was, in 1840, deepened three feet and made twenty feet wide on the bottom, with side slopes of two to one. The fall of the water toward the north is at the rate of from one to two feet per mile, giving it a rapid current. This artificial channel between Tonawanda and Oak-Orchard creek should, therefore, serve as a drain rather than as a means of overflowing the surrounding land. That this has been its effect, must be evident to any one examining the ground and seeing how much of it has been reclaimed and brought under cultivation within the past forty years.

The State has also expended a large sum in cutting the rock-dam which crosses Oak-Orchard creek between Coons' bridge and Shelby

Center, lowering the bottom of the channel nearly two feet. From the point where the Tonawanda feeder enters Oak-Orchard, the whole channel has been enlarged. This work was done at several different times. No records are to be found of the cost, or of the extent of the earliest cuttings, but between 1863 and 1867, the last great enlargement of this channel was made, of which careful records were kept, both as to quantity and cost.

These records have been furnished us by the State Engineer and Surveyor, and they show that at this time alone, the State expended $54,438.89 in enlarging and deepening the channel of Oak-Orchard creek below the junction of the feeder from the Tonawanda.

Your committee very carefully examined this question. A survey was made, and a profile is herewith submitted, executed by the division engineer of the Erie canal, and paid for by the State Board of Health. It shows that the original crest of the rock-dam was at least one and eight-tenths feet above the bottom of the present channel, and that the State has cut through the rock and earth a channel forty feet wide on the bottom, and capable of carrying off at least four times as much water as the natural channel of the creek, which in many places had hardly a bottom width of twenty feet.

After careful surveys and examination of the ground, we are convinced that the channel of Oak-Orchard creek below Coon's bridge, is now capable of discharging all the water that is brought down from the Tonawanda creek in ordinary stages of the water, together with twice as much Oak-Orchard creek water as could originally have passed out through this outlet.

The bottom of the channel has been lowered so much as greatly to increase the velocity of the stream, and the cross section is at least four times that of the original channel. The result of this is that the high water in the Oak-Orchard swamp undoubtedly continues for a shorter period than it formerly did, and that the average condition of the swamp is much better.

The work done by the State, instead of rendering the lands more swampy, has improved their condition. This beneficial effect of the State work was, to a certain extent, masked between the years 1869 and 1880 by excessive rain-falls. The report of the State Survey shows that during that decennial period the spring rain-falls were much greater than had ever before been known.

Since it is shown that the swamp is due solely to the excess of rain-fall over the discharging capacity of the outfall, it follows that

any large increase in precipitation will increase the saturation and possibly the extent of the swamp area. Any increase in the saturated lands between 1870 and 1880 appears to have been due to the increase in the rain-fall and not to any action of the State in its use of the lower part of Oak-Orchard creek, which gives outfall of the water of the swamp. Great as the enlargement has been in the channel through the rock-dam, it is not yet sufficiently deep to discharge the spring rains that fall upon and flow off from the water-shed of Oak-Orchard creek alone. The present channel through the rock appears to be capable of discharging but little more than half of the amount liable to flow off from the water-shed of Oak-Orchard creek. The plan annexed to this report shows that to discharge the flood-waters of the creek, a further deepening of about a foot is necessary. This small amount of cutting will so increase the slope of the water surface in time of flood, as greatly to accelerate the velocity of the flow.

The estimated cost of this further deepening of the rock-channel is $22,745, which is but a small proportion of the amount that has already been expended by the State. With this further enlargement of the water-way we are confident that sufficient outfall will be provided to thoroughly drain the swamp tracts of the Oak-Orchard basin, provided the channel through the swamp is properly enlarged.

If however, during times of flood in Oak-Orchard creek, the State should allow water from Tonawanda creek to be brought across by the feeder and poured into Oak-Orchard channel, the outfall provided in the plan annexed would be insufficient and the waters of Oak-Orchard creek might set back and submerge the lower lands of the swamp.

It is asserted, that the people on Tonawanda creek in the town of Royalton some five miles below the feeder, are in the habit of opening the gates in the bulk-head to allow the flood waters of the Tonawanda creek to find relief by pouring into the feeder and thence down into Oak-Orchard channel. It is the judgment of the committee, that it is the duty of the State to keep these gates closed in the time of flood, so that each drainage area, the Tonawanda and the Oak-Orchard respectively, shall have only the water which naturally discharges from its own water-shed.

The plan for an enlargement of the channel of Oak-Orchard accompanying this report is made on the supposition that the water of the Tonawanda creek shall be prevented from passing into Oak-

Orchard creek in the time of flood, thus leaving each stream to discharge its own waters. We do not however doubt that it would be greatly to the advantage of the land on Tonawanda creek below the feeder, if the lower Oak-Orchard channel could be so enlarged as not only to discharge its own waters in time of flood, but also part of those from the Tonawanda creek. It would not, however, be equitable to require the people of the Oak-Orchard basin to pay for any such enlargement. Such a regulation of the flow of water through the feeder from Tonawanda to Oak-Orchard will in no way interfere with the vested rights in water privileges on the lower part of Oak-Orchard creek between Shelby Center and Medina, nor will it in any way interfere with the supply of water required for the canal.

The enlarged channel of Oak-Orchard creek would be capable of delivering six hundred and twenty cubic feet of water per second, a much larger amount than now carried to the mills and canal. In time of flood it will be filled with water from the Oak-Orchard basin, and as this fails in the summer months, the supply can be increased by opening the gates into the Tonawanda and admitting the necessary additional amount of water required for the canal and mills. It appears that the Holland Land Company, to whom this whole region originally belonged, gave to the State the land necessary for the feeder, from Tonawanda to Oak-Orchard, in consideration of the valuable water privileges which would be created on the lower Oak-Orchard channel, in the town of Shelby, by the greatly increased water supply during the summer months.

In its original condition it is probable that a very small amount of water flowed down the channel from the Oak-Oarchard basin during the summer months; the height of the rock-dam before spoken of, kept back the waters so that instead of discharging down the channel, they passed off by evaporation from the great saturated areas above.

The lowering of the channel has undoubtedly increased the summer flow from the Oak-Orchard swamp. The still further lowering of this outfall and the enlargement and straightening of Oak-Orchard creek in accordance with our plan, will doubtless further increase the summer outflow from the Oak-Orchard water-shed. As secondary ditches for drainage purposes are constructed, a much greater proportion of the summer rain-falls will flow off, and the mills and canals will receive during the hot months much more water from the

Oak-Orchard basin than they get at present. Still it will be undoubtedly necessary to supplement this with a supply from the Tonawanda creek in the dry part of the year. Such additional summer supply from the Tonawanda will in no way interfere with the thorough drainage of the Oak-Orchard lands; but if a large quantity of water is allowed to pass down the feeder in the spring, when the Oak-Orchard channel is already filled to its utmost capacity, damage will occur to the lands adjacent to the lower part of Oak-Orchard creek, and the State might possibly be held responsible for such result.

Your committee have not had an opportunity to study the effects of the floods in Tonawanda creek on the lands and the health of the people of Royalton, in Niagara, and of Newstead in Erie county. It is however our impression, that some relief is needed for these lands from the excessive floods of Tonawanda creek. Should this be the case, one of the easiest methods of accomplishing the relief, will be to deepen the channel of Oak-Orchard between Coons' bridge and Shelby Center, sufficiently to carry, not only all the flood water of the Oak-Orchard basin, but also so much of the Tonawanda water as can safely be brought down the canal-feeder and discharged into the Oak-Orchard channel in time of high water.

Oak-Orchard creek is really a most valuable outfall for all the surplus waters of this region, because it has a very rapid descent to the north after passing Shelby Center. The question of the relief of the Tonawanda lands from excessive saturation, and the lowering of the water in that stream, so as to promote lateral drainage into it from the swamp-lands on either side, is alluded to here in order to show that it can probably be best accomplished by a very simple modification of the plan provided for the relief of the Oak-Orchard lands.

By sufficiently opening the channel of Oak-Orchard creek, the drainage of almost the whole of the Tonawanda swamp can doubtless be accomplished, the result being to discharge all the waters that fall upon the water-shed of Oak-Orchard creek, and to so lower the water in the Tonawanda as to promote thorough drainage of the lands along its course.

As we have before stated, twenty-five thousand acres of swamp land could be thoroughly drained, if the Oak-Orchard channel was so opened and deepened as to discharge the amount of water provided for in our plan.

To determine approximately the cost of this work, it was necessary to make borings along the course of Oak-Orchard creek, to ascertain

the character of the soil. These were made by Mr. J. W. Holmes, under direction of your committee. The results show that from Coons' bridge to the east branch of Oak-Orchard swamp, no rock is found within ten feet of the surface. The soil is a tough clay, with a coating of muck, which from the thickness of eight inches to a foot at the western end, increases to four or five feet thick at the eastern end of the swamp.

The plan herewith submitted for the improvement of Oak-Orchard creek, provides for a channel six feet deep, increasing in size from a surface width of twenty-four feet at its upper end in the town of Barre, to a channel of twenty-five and eight-tenths feet wide on the bottom, and forty-nine and eight-tenths feet wide at the top, with side slopes of two to one in the town of Shelby. The cross section is increased in proportion to the amount of water which will be discharged into it from lateral streams at various points along its course.

No rock excavation will be needed until a point is reached about 4,000 feet below Coon's bridge. From there northward the excavation of the channel will be in rock; but the breadth of the present water-way will give ample capacity to the stream. All that is required is a deepening of an average amount hardly exceeding a foot for a distance of 1.87 miles.

Above Coon's bridge the plan for the new channel follows the artificial cut off to the State road and thence up the present stream the greater part of the distance; but so many abrupt bends are cut off that between the State road and Boorham's bridge the course is shortened from 9.75 miles to 6.5 miles, and the fall increased from one foot to 1.5 feet per mile. It is estimated that the present channel supplies about four-tenths of the total excavation. The cost of the work, down to the beginning of the rock excavation, is estimated at $72,192. The cost of the rock excavation is estimated at $18,196. Twenty-five per cent is added for contingencies and engineering, and the total probable cost of the work is estimated to be about $113,000 dollars.

The number of cubic yards of earth to be moved is estimated at 288,767, and of rock 12,131.

No estimate is made for lateral ditches because these are local and special works that each town and district can execute for itself when a common outfall channel is provided for the whole basin.

The construction of such a common outfall channel as is here planned, will doubtless benefit the towns of Byron, Elba, Oakfield

and Alabama in Genesee county, and of Shelby, Barre and Clarendon in Orleans county. The benefits to the towns of Clarendon and Byron will probably be less than to the other towns since the greater part of their swamps more naturally drain into Sandy creek. The great benefits to them will be in so cutting off the waters, which now spread through the swamp from the town of Barre into the towns of Clarendon and Byron, that the town of Clarendon can execute its own drainage system finding natural outfall into the east branch of Sandy creek; but the five towns of Barre, Shelby, Alabama, Oakfield and Elba, will be benefited in several ways.

In the first place there will doubtless be a general improvement in the public health. The enlargement of the creek, so as to thoroughly drain all the surrounding lands, will stimulate the execution of local drainage works through these towns. This will result in a very general improvement to the health of the citizens, and in the productiveness of the lands drained.

There is a noticeable tendency of all flat lands, both in the central and lateral valleys of the Oak-Orchard basin, to become more or less saturated, and the minor brooklets erode very small channels into the tough clay soil. These are generally choked with rank vegetation. Where drainage works have already been executed in the town of Barre, there has been great improvement in the productiveness of the soil. These local drainage works will therefore be undertaken for agricultural purposes, and, while they will increase the value of property, they will also have a marked influence on the public health of the towns.

This has been the history of agricultural drainage in England. A large part of England formerly suffered severely from miasmatic diseases. Wherever agricultural drainage has been thoroughly carried out, these diseases have largely disappeared; and these works have been so extended in England, that the agues often mentioned by early writers are now hardly known.

There can be little doubt that the result of the execution of such a plan as is herewith submitted will be to encourage all holders of saturated lands to construct lateral drains; and a thorough development of such drainage works will greatly improve the health of the towns mentioned.

The beneficial effects of the enlargements of Oak-Orchard creek will be felt, not only by those who own lands lying in the bottom of the basin, but by all swamp districts situated on its slopes. There are many tracts of such lands on the lateral streams that flow down

into Oak-Orchard. As these streams reach the central part of the basin their flow becomes so sluggish that Oak-Orchard creek does not carry off their waters, and all those lateral channels are throughout the greater part of the year filled with water to their utmost capacity.

If extensive drainage works were now carried out, on the upper courses of these lateral branches of Oak-Orchard, the effect would be to greatly increase their flow. As the channels below are already full, such increased flow would spread over the low lands in the central part of Oak-Orchard basin and damage the holders of property on the lower parts of the lateral streams.

The law as laid down by the Court of Appeals is, that proprietors may, by improvement of the drainage and other proper uses of their land, increase the volume of water in a stream provided they do not increase the quantity beyond the natural discharging capacity of the channel below them, but any artificial increase of the natural flow of water which will cause the lower part of the channel to overflow is unlawful.

Unless the main Oak-Orchard creek is enlarged, so as to permit of an outfall for the waters that enter it by lateral streams, the water in the lower courses of these lateral streams will be set back through the greater part of the year, so that no lawful increase can be made in the water flowing down the lateral valleys. Any important drainage improvement on the upper parts of these lateral valleys will certainly increase the flow of water. The rain-water falling upon the upper swamps has been in large part held by them, and much of it has escaped by evaporation. This evaporation has, on certain tracts of land, doubtless amounted to from sixty to seventy per cent of the rain-fall. When ditches are opened through such swamps, and the natural channels are straightened and enlarged the water, instead of being retained and evaporated, flows off into the ditches and thence into the water channels, greatly increasing the flow of these streams. Any such increase in the flow of the lateral branches of Oak-Orchard creek will be greatly to the detriment of the lands in the lower part of the basin, because the water channels are now naturally filled to their utmost capacity.

Between seven thousand and eight thousand acres have thus been drained in the town of Barre, and the waters have been poured down into the southern portion of the township and into the town of Oakfield, in Genesee county.

The people owning the lower lands complain that they have be-

come much wetter than formerly, and it would seem as if their complaint was well founded. All the proprietors of the Oak-Orchard water-shed have therefore a common interest in enlarging the Oak-Orchard creek to give a common outfall for the drainage of all parts of the basin.

In addition to the improvement in health and the increase in the value of property throughout the towns, there will undoubtedly be an especial gain in the value of the lands of the great swamp now lying along the center of the Oak-Orchard valley.

These lands, now practically useless for agricultural purposes, will become rich farming lands if the owners avail themselves of the opportunity for improvement afforded by the deepening and enlarging of the Oak-Orchard creek.

It is difficult to estimate the probable increase in the value of the lands most directly benefited; it is not unlikely that their value will be raised at least fifty dollars an acre. There are about twenty-five thousand acres of these swamp lands in the central valley of the Oak-Orchard basin and on the divide at its eastern end. It appears therefore not unreasonable to suppose that the valuation of these swamp lands, when they are brought under cultivation, will be increased from $1,000,000 to $1,250,000. This increase will of course take place slowly as the lands are cleared, grubbed and tilled.

Of course the greatest improvement in health also will be most likely to occur among people living within a mile or two of the main swamp.

A public benefit will also be felt by the towns in the relief experienced from the costly repairs which are now required to maintain the roads across the swamp. There are seven such roads, some of which it is now very expensive to maintain. We are informed that one of the roads which crosses the swamp in the town of Alabama has been for many years repaired at an annual cost exceeding $200. The spring floods sweeping over these roads carry away the road beds, and gravel has to be hauled for a long distance to reconstruct them when the waters fall.

Not only are these repairs costly, but there is undoubtedly a public loss in the fact that these roads are difficult of passage during floods, and when seriously washed they are likely to become impassable.

The public benefits which may be confidently expected from the execution of the plan submitted are therefore a marked and extensive improvement in the public health, large increase in value of prop-

erty, and a lightening of the burden of taxation now necessary in maintaining highways across the swamp.

We have not felt it important to secure plans for the lateral or secondary drainage channels, which should come down into Oak-Orchard creek from the north and from the south, as the management of such questions of lateral drainage will be comparatively simple when the necessary outfall channel is provided.

Until the enlargement and deepening of Oak-Orchard creek and its outfall have been accomplished, comparatively little can be done in the way of local drainage of the lands in the central part of the basin. There are, however, many small detached tracts of swamp lands lying at such elevations above Oak-Orchard creek that they might now be drained by their owners, acting together under the present drainage law. Such drainage would, however, under present circumstances doubtless damage the lands below them and be illegal if on a large scale. The carrying out of this improvement of Oak-Orchard creek is so clearly a great local benefit to the counties and towns where the lands to be improved lie, that means for the execution of the plans should undoubtedly be provided by those who are directly benefited.

The State has already expended so much in the improvement of the outfall of Oak-Orchard creek, above Shelby Center, that it seems to be under no further obligation in this matter unless it should be considered public policy for the State to render some assistance, for the purpose of promoting and securing the execution of comprehensive drainage works whose beneficial effects are to be felt in several counties, and works on so large a scale as to be difficult of execution by co-operation among many towns. Your committee cannot learn that any effort has ever been made to carry out, under the present drainage law of the State, any work so large as that necessary for the drainage of the Oak-Orchard basin, nor is it clear to us that it would be practical for the localities concerned to combine and execute this work under the present drainage act.

Whether or not it should be considered public policy for the State to lend its engineering and pecuniary aid in this case where the water-channel concerned is the property of the State and a part of the Erie canal; it is evidently the duty of the State to provide such legislation as will make it practicable for those towns and counties immediately benefited to carry out the work if they see fit.

CONCLUSION.

In conclusion, therefore, your committee report that in their opinion the Oak-Orchard swamp is injurious to the health of the people living in its vicinity, and also liable to injure many of those who are in the habit of crossing it; that the original cause of this swamp was the existence of hard strata of limestone, crossing the lower course of Oak-Orchard creek at right angles so as to form a dam across the natural outfall of Oak-Orchard basin; that, therefore, the water falling upon this water-shed has been in great part, retained in the central valley of the basin, causing a swamp of about 25,000 acres; that the channel of Oak-Orchard creek is not large enough, nor is the outfall of the creek sufficiently deep, to carry off the waters which fall upon this water-shed in the spring; that the Oak-Orchard creek is a feeder to the canal, and, by law, a part of the Erie canal; that the State has already, by an expenditure of from $50,000 to $70,000 lowered the bottom of the outfall through the rock-dam, before spoken of, at least four feet below the average surface of the rock at several points, and enlarged the section, so that the outfall channel between Shelby Center and Coons' bridge is now capable of discharging from four to five times as much water as formerly could pass through the natural channel of the creek; that this work done by the State will decidedly faciliate the discharge of the spring floods from Oak-Orchard swamp, provided the gates at the head of the feeder from Tonawanda creek are kept shut, so as to prevent the flood waters of Tonawanda creek from being poured into the Oak-Orchard basin; that, notwithstanding the work done by the State, the outfall channel through the rock-dam, between Coons' bridge and Shelby Center, is not yet deep enough to discharge more than one-quarter of the flood waters liable to flow off from the Oak-Orchard basin; that the channel of Oak-Orchard creek winding through the swamp in the basin, is too shallow, too small, and too crooked to discharge the waters which naturally flow from the surrounding water-shed of the basin; that the greater part of the lands of the swamp lie at such a level that they cannot be thoroughly drained until the channel of Oak-Orchard creek has been enlarged, deepened, and straightened, to permit the passage of a body of water amounting to six hundred cubic feet per second at Coon's bridge, at the lower end of the basin; that such improvement of the channel of Oak-Orchard creek, would permit of the construction of lateral or secondary channels, which with their branches, would lower the sub-soil waters of the swamp from three to four

feet during the greater portion of the year, and permit of their being cleared and cultivated; that the evident increase in the value of these lands when drained, would encourage and promote the drainage of the lateral swamps lying within the basin; that the result of such drainage would be both local and general improvement in the health of the people living in the towns of Clarendon, Barre, and Shelby, in Orleans county, and of Byron, Elba, Oakfield, and Alabama, in the county of Genesee, as well as an indirect benefit to Royalton, in the county of Niagara by protecting it from Oak-Orchard floods; that this improvement of the channel of Oak-Orchard creek, with a subsequent system of lateral channels, would be both a private benefit to the owners of the swamp-lands, both in the center of the basin and in its lateral valleys, and a public benefit to all people of the towns that are now exposed more or less to the miasmatic influence of the swamps, and be also a public benefit by greatly increasing the value of taxable property in these towns and counties, by enabling the now unwholesome region to be settled and cultivated by industrious citizens, and by lessening the cost of maintaining the public highways.

We therefore recommend to the Legislature, that, provided the existing laws are inadequate to meet the necessities of the case, such legislation be enacted, as will enable the citizens of the towns interested, to unite in the accomplishment of this extensive enterprise so important for the public health.

Committee.

JAMES T. GARDINER, *Chairman.*
JAMES G. HUNT,
ERASTUS BROOKS.
EDWARD M. MOORE, *President.*
ELISHA HARRIS, *Secretary.*

SPECIAL REPORT

ON THE

TOPOGRAPHY, HYDROGRAPHY AND DRAINAGE

OF THE

OAK ORCHARD BASIN AND SWAMP.

BY JAMES T. GARDINER, DIRECTOR.

To the Commissioners of the State Survey:

Senators Edmund L. Pitts, T. E. Ellsworth, Sumner Baldwin and Robert O. Titus, whose senatorial districts include or adjoin the counties of Genesee, Orleans, Niagara and Erie, on the 7th of April last addressed a communication to the State Board of Health, requesting that board to investigate at once the sanitary necessity for the drainage of extensive swamp areas on the Tonawanda, Oak Orchard and other creeks, desiring the Board to report to the next Legislature whether a necessity for such drainage exists, and by what means systematic drainage can best be effected.

On receipt of this communication, the State Board of Health applied to me, as director of the State Survey for an immediate extension of the triangulation of the survey over the counties of Monroe, Genesee, Orleans, Niagara and Erie, especially such parts of them as were directly or indirectly related to the extensive swamp lands of that region, alleging that the maps and surveys of these districts have not been made with sufficient precision for sanitary studies, nor do they give with sufficient accuracy the elevations which must furnish the essential basis for an investigation into the causes of these swamps and the proper means for draining them.

This request of the State Board of Health was laid before the Board of Commissioners of the State Survey, and I was directed to begin at once the triangulation of the region, and to furnish the State Board of Health all possible assistance in the matter.

Under this authority, and for these reasons, I instructed Assistant Horace Andrews, Jr., to make a reconnoissance of the region, basing

our work on that of the United States Lake Survey, with which the State Survey triangulation has already been connected. From the information secured in this reconnoissance, I determined on the plans for such a survey of the most important part of the swamp region as should furnish enough datum points on the Oak Orchard creek watershed to enable local surveys to be made with precision, and at the same time to so distribute these datum points as to determine elevations that would bring out the true general shape of the hydrographic basin of Oak Orchard creek.

Mr. Andrews was intrusted with the execution of this work, and it has been performed with a skill and rapidity most creditable. I feel sure that the economy with which the survey was done will compare very favorably with any work of the kind.

Seventeen triangulation stations were occupied, and about forty-five points were located in the towns of Shelby, Byron, Barre, Elba, Oakfield, Alabama, Batavia and Stafford, in the counties of Orleans and Genesee.

This work is of a high order of precision. Each angle was measured by six sets of measurements of six repetitions each, made with an eight-inch Troughton and Simms circle reading to seconds, having a telescope of twenty-four inches focal length and a $2\frac{1}{2}$ in. object-glass. The accuracy obtained is shown by the fact that the mean error of closure of twenty-one triangles, the whole number tested, is 1.46 seconds. Although the work is so precise, Mr. Andrews occupied seventeen stations in about a month, including the time spent in moving the instruments from one station to another.

The stations are marked, after the usual manner of this survey, with pots buried in the ground, and with enduring granite posts set in cement. The points located, besides stations, were church spires and other prominent objects in the towns mentioned, including points in the following villages and hamlets: West Shelby, East Shelby, Millville, West Barre, Barre Centre, Batavia, North Byron, Oakfield, Elba, Alabama Centre, South Alabama and Morganville.

In addition to the angular measurements from which the horizontal distances and the courses between these points are deduced, their elevations above the sea were accurately determined by means of the spirit-level. Mr. Andrews ran lines from the canal benches at Medina, Albion and Holley, through the Oak Orchard basin, dividing the area into a number of circuits, whose error of closure furnished the necessary check on the precision of the work. These circuits taken together include

ninety-five miles of level lines run. The work was executed in about a month. In traversing the region many permanent benches were marked and their elevations accurately determined. There are in all 132 benches fixed by the State Survey in and about the Oak Orchard water-shed. Appended to this report is a list of these benches, their positions, designations and elevations.

In this region where the slopes of the ground are very gentle, and where the successful drainage of many thousand acres of swamp land depends on accurate knowledge of the surface elevations, it is of great importance to have a number of datum points whose heights are so precisely known as to be available for reference, and for the checking of local surveys.

Such a system of reference points or benches can only be established by State authority. Already the local surveyors of the region have availed themselves of these points.

As our survey progressed and the configuration of the water-shed of Oak Orchard swamp was developed by accurate measurement, it became apparent that many of the schemes which had been proposed for the drainage of this tract were based on mistaken ideas concerning its form and slopes; and it finally became evident, as the result of our work, that nature had provided one perfectly simple means which, if utilized, would secure thorough and complete drainage of the region, reclaiming a waste and unwholesome swamp of some 25,000 acres, and converting it into rich agricultural land.

At the earnest request of the State Board of Health I have, with the assistance of Mr. Andrews, developed this plan of drainage for the Oak Orchard and, possibly, the Tonawanda swamps. The drawings necessary for its explanation accompany this report.

The principal map is a sketch of the hydrography of the Oak Orchard water-shed, showing the courses of the water channels and the elevations which govern the flow of the streams, and outlining the general configuration of the water-shed and of the divide which separates it from other basins. There are also cross sections, showing the slopes of the sides of the basin and the character of its central portion, which is now a swamp. A longitudinal profile shows the slope of the central trough of this basin through which Oak Orchard creek flows from east to west.

This longitudinal section is extended to include Oak Orchard creek as far as Shelby Centre, where the natural outfall occurs for the waters of the swamp. It also shows such changes in the channel

of Oak Orchard creek as will secure complete drainage through the swamp.

TOPOGRAPHY OF THE TONAWANDA SWAMP.

The first step in the solution of the questions involved in draining this area, was to determine the general configuration of the surface.

The Oak Orchard water-shed is but one of several drainage basins in this region which contain large tracts of swamp land. In fact, the swamps of Tonawanda creek, Oak Orchard and Sandy creeks run together, so as to form one continuous tract of swamp land, extending from near the towns of Lockport and Clarence, in Niagara and Erie counties, eastward through Genesee and Orleans counties, into the town of Clarendon, on the border of Monroe county. In this distance the swamp passes over two divides, and the whole was formerly called the Tonawanda swamp.

Its slopes are so gentle that to the first settlers it appeared flat. In times of flood, before the improvement and enlargement of the lower part of Oak Orchard creek, the waters of this region probably often flowed over the low divide in the northwest corner of Alabama into the Tonawanda swamp proper. This great swamp tract was originally some 30 miles long, and from two to three wide, and contained from 60 to 90 square miles. Some portions of it have been wholly or partially reclaimed, and the exact area of the swamp is not now known.

That part of it which lies in the counties of Orleans and Genesee has recently been approximately measured by Mr. J. W. Holmes for the State Board of Health, and is found to contain 25,760 acres, distributed through the different towns in the following amounts :

Portion of large swamp in Orleans county :

In Shelby	3,482 acres.
In Barre	6,117 "
In Clarendon	2,361 "
Total	11,960 acres.

In Genesee county :

In Byron	524 acres.
In Alabama	5,721 "
In Oakfield	4,045 "
In Elba	3,510 "
Total	13,800 acres.
Total area of main swamp in Orleans and Genesee counties	25,760 acres.

This measurement does not include all of the swamp lands in the townships named, but only the great central swamp with its branches. There has been no exact measurement of the area of that portion of the swamp which extends into Niagara and Erie counties.

The great swamp is naturally divided into three basins, drained by three different streams. The divides between these are low, but they are, nevertheless, defined, and of great importance in the question of drainage. The waters of the Tonawanda are separated from those of the Oak Orchard creek by a well marked divide running through the southern part of Batavia, and thence northwesterly through the central part of the town of Alabama, until near the northwestern part of that township, where the divide becomes so depressed that the flood water of the two streams sometimes overflows the low separating elevation, and covers the tract between the two swamps.

At the eastern end of the great swamp, the 2,900 acres which lie in the townships of Clarendon and Byron were found to be on the head waters of Sandy creek, and on the divide between Sandy creek, Oak Orchard and Black river. Between 22,000 and 23,000 acres of the great swamp are contained in the natural water-shed of Oak Orchard creek. The differences of level between the outfall of Oak Orchard creek and the lands on the Tonawanda, in the town of Royalton, and the elevation of the low divide between the waters, show that if the drainage of the Oak Orchard basin was thoroughly provided for, not only would the swamps which border the Tonawanda be protected from all danger of overflow from the Oak Orchard watershed, but also the surplus flood waters of the Tonawanda might safely be given an outlet to the north through the Oak Orchard channel, if it were sufficiently enlarged.

The Oak Orchard water-shed evidently contains the largest portion of the swamp; and until its drainage is provided for, no thorough relief can be expected for the tracts lying along the Tonawanda.

Since it appeared from our reconnoissance that a plan for the drainage of the Oak Orchard water-shed would furnish a key to the solution of the whole drainage of the district under consideration, our special study was devoted to the Oak Orchard basin.

The Oak Orchard water-shed is an oval basin 17 miles long from east to west, and about nine and one-half miles broad from north to south in its widest part. It narrows at either end to a width of about two miles. The area is 88,000 acres, or a little less than 138 square miles. The north and south sides of the basin descend to a

central valley or trough, whose bottom slopes from east to west with a fall of 25 feet in 14 miles, or an average fall of 1.8 feet to the mile. This central trough or valley is a swamp about two miles wide, through which Oak Orchard creek winds sluggishly from the eastern end of the basin, on the borders of Byron and Clarendon, westward along the county line between Genesee and Orleans counties, through the towns of Elba, Oakfield, Alabama and Shelby.

In the towns of Alabama and Shelby the Oak Orchard swamp basin ends, and here Oak Orchard creek turns from its westerly course and runs directly north through Shelby Centre and Medina. From the point where Oak Orchard creek turns northward in the town of Shelby it had originally very little fall for the first three miles, the elevation of the bottom of the creek being about 607 feet at the bend, while a little over two miles below, the rock bottom of the channel was 607.2 feet, and a little less than three miles below the bend, the elevation of the rock channel was about 606 feet.

Two miles below this bend there crosses nearly at right angles with the stream, a ledge of very hard limestone trending east and west. Over this limestone the Oak Orchard creek finds its way about three miles, till it falls some 40 or 50 feet over the edge of the hard strata at Shelby Centre. The records in the office of the State Engineer and Surveyor show that the crest of this rock dam was originally at an elevation of 607 to 609 feet. A mile and a half east of the bend, where the main road from Alabama Centre, the "State Road," crosses the swamp, the average elevation of the creek bottom is about 609 feet, and the surface of the ground is 612.5 feet. The slope of the valley above this is never less than a foot and a-half to the mile, the average slope being 1.8 feet per mile.

The southern side of the dam of solid limestone strata above spoken of is situated a little over two miles south of Shelby Centre. The creek runs over the higher part of this rock for a mile and three-quarters; thence the slope to the dam at Shelby Centre is quite rapid. For about a mile of this distance the surface of the rock appears to have had originally an elevation of from 606 to 607 feet, these being the lowest levels of the bottom of the creek. The average rock surface level where the channel now runs was from 608 to 609 feet.

The limestone is so hard that a creek having but little fall could erode through it only a small channel. The rocks in this region dip in a southerly direction with a fall, it is said, of about 40 feet to the

mile. Above the thick, hard limestone, which forms this Oak Orchard dam, comes a succession of soft argillaceous shales, whose disintegration furnishes the clays which make the soil of the Oak Orchard water-shed. Below the rocky barrier, the descent of Oak Orchard creek becomes quite rapid, until at Shelby Centre there is an abrupt declivity, the stream falling down from an elevation of 588 feet at Shelby Centre to 516 at Medina. Had it not been for the rocky barrier above Shelby Centre, Oak Orchard creek would undoubtedly have cut its channel deep enough and large enough to carry off all the waters of its basin. This rocky barrier, in its higher part a mile and three-quarters broad, seemed so formidable an obstacle in the drainage of the Oak Orchard swamp that many schemes have been proposed for draining it through another outlet.

The results of our survey show that such attempts would be costly and disastrous failures.

The crest of the divide which surrounds the Oak Orchard water-shed is lowest at a point in the north-west corner of Alabama, where it joins the Tonawanda basin. Here the elevation of the divide, which happens to be on the county line, is 615 feet, while the water in Oak Orchard creek, a mile to the east, is 612½ feet, the divide being about 2½ feet above the creek.

Owing to the fact that the Tonawanda cannot dispose of its surplus waters, any attempt to drain the Oak Orchard basin in this direction would be futile. Along the southern side of the basin the divide has an elevation of 750 to 900 feet. At the extreme easterly end of the water-shed, the elevation of the divide is from 640 to 642 feet. These elevations are along the town lines of Byron and Clarendon; but within a mile to the westward the ground falls from three to five feet; and two miles to the west of the divide the elevation is only 634 feet, and the slope is then about uniform to the westward.

All attempts to drain the central swamp of Oak Orchard eastward in a direction exactly opposite to its natural slope would be unsuccessful. On the north side of the basin the crest of the divide sinks in its lowest place north of West Barre to an elevation of about 650 feet. The northern divide of the water-shed varies greatly in elevation, ranging from 650 to 700 feet. These elevations are in the towns of Shelby and Barre. As the elevations along Oak Orchard creek and its adjacent swamps range from 636 and 637 feet at the eastern end of the swamp, to 611 and 612 feet at the western end, the water could only be carried through the northern divide by a cut

over 30 feet deep and about six miles long, or else by a tunnel of greater length.

Any such costly enterprise is shown by this survey to be entirely unnecessary, since there is ample slope to the natural valley of Oak Orchard creek to carry off all water that accumulates on the swamp, provided that the channel of the creek was made sufficiently straight and deep, and the outfall properly enlarged.

The swamp which forms the bottom of the Oak Orchard valley was found not to be flat, although to the eye it appears so; but to have very decided slopes from both sides toward the channel of the creek, as well as a steady slope toward the west. Some of the lateral branches of the swamp were proved to have a slope of even 20 feet to the mile; while the slope from the edge of the swamp toward the creek is never less than two feet per mile.

These facts concerning the general shape of the basin of the Oak Orchard water-shed will be better understood by an examination of the hydrographic sketch accompanying the report. The results of the survey are conclusive proof that the Oak Orchard swamp is caused by an accumulation in the low lands of the rainfall, which the channel of the creek is not sufficiently large to carry away.

To determine whether it is practicable to improve the channel of the creek so as to drain the Oak Orchard swamp, and to relieve the low lands of all danger of being flooded, it was necessary to ascertain what amounts of water are likely to flow off from this water-shed into the creek during all seasons of the year.

The waters that flow from the Oak Orchard basin are supplied from two sources. There are along its southern side a large number of springs which probably depend for their water on the rainfall of the high plateau just south of the Oak Orchard water-shed.

This plateau is drained by the Tonawanda creek, but the Helderberg limestone, which underlies it close to the surface, is quite pervious to water. The elevation of the plateau about Batavia is about 900 feet. Two miles north of Batavia the plateau ends and the Oak Orchard water-shed begins. For the next five miles the land descends to the north, falling from an elevation of 900 feet to the Oak Orchard creek, which at this point is 630 feet. The waters of the Batavia plateau which percolate through the Helderberg limestones find outlet along the edges of the strata on this southern side of Oak Orchard basin.

An examination of these springs shows, however, that the amount of

the water which they furnish is insignificant compared with the rain-waters falling directly upon the Oak Orchard water-shed; and that therefore the flow of springs need not be separately considered in determining the off-flow of the Oak Orchard basin in times of high water.

Flow from Water-Sheds.

It is important to ascertain with a fair approximation to accuracy, the amount of water flowing off from water-sheds of various kinds throughout the different parts of the State. Such knowledge of the flow of streams is needed in the first place to determine the amount of water which water-sheds of different characteristics can be relied upon to furnish, as water supplies to our towns, villages, factories and navigable channels; and in the second place to fix the quantities of water which must be provided for in drainage works.

The flow that can be expected from any stream depends upon the amount of rain that falls upon the water-shed; upon its geological and topographical structure; upon the quality of its soil and the vegetation which covers its surface, and upon the conditions of the climate as respects heat, moisture and wind. In each water-shed these conditions are found in different proportions; but it would be possible to classify the hydrographic basins of the State, both as to climate and structure, and select certain typical ones from each group for accurate investigation. Upon these typical areas observations of rainfall and flow of streams might be made for a series of years, which would furnish the essential data in determining what quantity of water can be secured for human use from different water-sheds of the State.

There is an almost complete ignorance at present of the relation between the flow of our streams and the rainfalls on the water-sheds. I can learn of no continuous observations taken in this State, except on the Croton water-shed; and even on this important gathering ground the observations were taken but for a few years, and the results are imperfect. Knowledge of the flow of our streams has a most important bearing on the preservation of the navigable rivers of the State, and of the Erie Canal. On it depends the question of the preservation of the Adirondack woods for the purpose of maintaining the supply of water in the Hudson, Mohawk and Black rivers, and in the Raquette, St. Regis, Saranac and Au Sable rivers.

Rainfall, Evaporation and Destruction of Woods.

The following records of rainfall show conclusively that there has been no diminution in the rainfalls of this State since 1827.

The following is a brief summary of the rainfalls at various places, classified in periods in such way as to show whether any decided change has taken place:

Table of Mean Annual Rainfall During Long Periods.

Albany ---------- 1826–1849, mean annual rainfall, 40.93 inches.
" ---------- 1850–1870, mean annual rainfall, 39.79 "
" ---------- 1870–1880, mean annual rainfall, 38.73 "
Showing a slight decrease in 54 years.

Cazenovia -------- 1830–1839, mean annual rainfall, 37.78 inches.
" -------- 1839–1849, mean annual rainfall, 39.74 "
Showing a slight increase between 1830 and 1850.

Potsdam ---------- 1828–1838, mean annual rainfall, 29.16 inches.
" ---------- 1838–1846, mean annual rainfall, 28.26 "
Showing a slight decrease in rainfall.

Pierrepont Manor. 1850–1861, mean annual rainfall, 33.92 inches.
" " 1861–1871, mean annual rainfall, 38.42 "
Showing a decided increase at this point.

Auburn ---------- 1827–1838, mean annual rainfall, 47.10 inches.
" ---------- 1838–1849, mean annual rainfall, 46.14 "
Showing a slight decrease.

Rochester ---------- 1830–1840, mean annual rainfall, 27.71 inches.
" ---------- 1840–1850, mean annual rainfall, 32.29 "
" ---------- 1850–1860, mean annual rainfall, 33.42 "
" ---------- 1860–1870, mean annual rainfall, 35.98 "
" ---------- 1870–1880, mean annual rainfall, 38.00 "
Showing a steady increase in the rainfall of that part of the State.

This series of observations, taken at Rochester University until 1871, and after that by the United States Signal Service, covers a period during which the greater part of the woods were cut from that region. They show that during the time the forest was being destroyed the rainfall was steadily increasing. There could, of course, have been no causal relation between the two facts.

While it is thus evident that the destruction of the woods has not modified the mean rainfall, it has materially affected the flow of streams; and this effect has been different on different water-sheds. If a series of continuous gaugings could have been made of the flow of typical streams during the past 30 years, we should now be able to say with sufficient definiteness how much the flow of our streams will be increased during the flood months, and how much

lessened during the summer by the changes that have occurred in the surface conditions. At present we can only form an approximate estimate of the monthly flow of streams from any water-shed in the State, except the Croton.

The water which falls on a given hydrographic basin either runs off into its streams, sinks into the ground, or passes into the air by evaporation. That which is absorbed by the ground, and not afterward evaporated, sooner or later finds its way into the water channels and is utilized; but that part which escapes by evaporation is lost for use in the streams. This loss by evaporation is far greater than is ordinarily supposed.

A series of accurate observations of the flow of water from the Cochituate water-shed, from 1852 to 1875, shows the following percentages of water received into the lake during these years, together with the annual rainfall. The area of this water-shed is 12,077 acres.

Annual Percentage of Rainfall Flowing off of the Cochituate Water-shed.

Year.	Rainfall.	Percentage of rain in lake.
1852	47.93.	43 per cent.
1853	55.73.	35 "
1854	43.15.	53 "
1855	34.96.	No acc't kept.
1856	40.80.	No acc't kept.
1857	63.10.	74 per cent.
1858	48.66.	40 "
1859	49.02.	78 "
1860	55.44.	35 "
1861	45.44.	56 "
1862	49.69.	45 "
1863	69.30.	39 "
1864	42.60.	40 "
1865	49.46.	43 "
1866	62.32.	25 "
1867	56.25.	36 "
1868	49.71.	50 "
1869	64.34.	36 "
1870	55.89.	47 "
1871	45.39	33 "
1872	48.47.	35 "
1873	45.43.	60 "
1874	35.93.	54 "
1875	45.49.	39 "
Average	50.19.	45 per cent.

The water-shed has comparatively gentle slopes and deep gravelly soil. Since it must be supposed that each year approximately the same percentage of rainfall would escape by percolation, and find outlets in distant water channels, it follows that the great variations in the percentage of rainfall flowing into this lake depend principally upon the differences in evaporation from season to season.

In 1866 only 25 per cent of the rainfall of the basin flowed into the lake which drains it. In 1857, with almost the same rainfall, 74 per cent of the water flowed into the lake. Thus in 1866, 75 per cent of the rainfall was lost by percolation and evaporation, while in 1875 only 26 per cent was so lost. The average loss of water is shown to be 55 per cent during 22 years.

The monthly flow from the Cochituate as compared with its rainfall has been summarized by Mr. J. T. Fanning, C. E., in his work on the water supply, as follows :

SUMMARY *of Percentage of Rainfall Flowing from the Cochituate Basin.*

Average percentage of average annual rainfall flowing off 45.6.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Mean	52.5	79.7	71.3	80.50	45.1	35.1	20.3	20.0	24.5	26.5	27.8	64.3
Minimum	33.	26.	44.	39.	20.	9.	9.	14.	13.	10.	20.	24.
Maximum	79.	159.	153.	124.	76.	84.	39.	27.	39.	80.	42.	261.
Ratio of monthly mean	1.15	1.75	1.56	1.77	0.97	.770	.44	.44	.54	.58	.61	1.41

This shows that in minimum years, during the months of June and July, only nine per cent of the monthly rainfall flowed off into the lake. In the maximum years there flowed into the lake in June 84 per cent, and in July 39 per cent of the rainfall, while the mean flow varied from 84½ per cent in April to 20 per cent in August.

The Croton water-shed has a character essentially different from that of the Cochituate. The slopes are steep, and a thin coating of gravel soil is underlaid by very dense gneissic rock. Although there are but very few years of recorded observations of the flow from this basin, it is clear that the loss from evaporation probably reaches 50 per cent of the annual rainfall. The basin is much larger than the Cochituate, the total area draining into Croton lake being 338.8 square miles.

From very large water-sheds the percentage of rainfall flowing in the main stream is much less. In Humphreys and Abbott's report on the Mississippi, the following figures show the amount of water flow-

ing in important rivers expressed in percentage of rainfall on the basins which they drain:

Annual Downfall and Drainage of River Basins.

Names.	Area of basin. Square miles.	Ratio drainage to downfall.
Ohio river	214,000	0.24
Missouri river	518,000	0.15
Upper Mississippi	169,000	0.24
Arkansas (White) river	189,000	0.15
Red river	97,000	0.20
Entire Mississippi, exclusive of Red river	1,147,000	0.25

In addition to these facts, which of themselves clearly show the magnitude of the loss of water by evaporation from large hydrographic basins, I give the results of some direct experiments made in Denmark and England on the amount of water evaporated at several points in Europe, where accurate observations have been made. These are given as quoted by Mr. Fanning from "Beardmore's Hydraulogy."

EVAPORATION *from Water at Emdrup, Denmark.*

YEAR.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1849	1.1	0.3	1 8	2.5	4.1	5.8	4.7	4.0	2.6	1.1	0.9	0.6	29 5
1850	1.1	0.3	1 2	1.7	4.5	5.6	4.8	4.8	2.4	1.6	0.9	0.2	29.1
1851	0 5	0.4	0.7	1.7	4.2	4.8	5.7	5.1	2.7	1.5	0.6	0.5	28.4
1852	0 7	0.5	0.8	2.4	3.8	4.6	6.4	4.5	2.7	1 7	0 8	0.5	29.4
1853	0.5	0.1	0.7	1 0	4.1	6 2	5.1	4.2	2.8	1.1	0.6	0.5	26 9
1854	0.5	0.9	0.9	3.2	3.3	4.5	5.2	4.3	2.6	1.2	0.7	0.6	27.9
1855	1.0	1 1	0.5	1.2	2.6	4.1	4.7	4 1	2.8	1.4	0.9	0.7	25.1
1856	0.5	0.5	1 2	2.1	2 8	4.6	4.3	4.0	2.0	0.9	0.6	0.5	24.0
1857	0 7	0.6	0.6	1.4	4.1	6.6	5.9	4.3	3.2	1.4	0.7	0.4	29.9
1858	0 4	0.7	1.2	3.1	5.1	6.1	4.9	5 6	2.8	1.6	0.7	0.4	30.6
1859	0.3	0.5	0.7	1.9	4.3	5.8	5.3	3.8	1.8	1.0	0.7	0 3	26.4
Mean	0.7	0.5	0.9	2.0	3.7	5.4	5.2	4.4	2.6	1.3	0.7	0.5	27.9
Ratio	.301	.215	.387	.860	1.592	2.323	2.237	1.892	1.118	.559	.301	.215	....

Mean Evaporation from Short Grass, 1852 to 1859, inclusive.

Mean	0.7	0.8	1.2	2.6	4.1	5.5	5.2	4.7	2.8	1.3	0.7	0.5	30.1

Mean Evaporation from Long Grass, 1849 to 1856, inclusive.

Mean	0.9	0.6	1.4	2.6	4.7	6.7	9 3	7.9	5.2	2 9	1.3	0.5	44.0

Mean Rainfall at same Station, 1848 to 1859, inclusive.

Mean	1.5	1.7	1.	1.6	1.5	2.2	2.4	2.4	2.0	2.3	1.8	1.5	21.9

EVAPORATION *from Earth — Mean Evaporation from Earth, at Bolton Le Moors, Lancashire, Eng.*, 1844 *to* 1853, *inclusive.*

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Mean.....	0 64	0.95	1.59	2.59	4.38	3.84	4.02	3 06	2.02	1.28	0.81	0.47	25.65
Ratio.....	.299	.444	.729	1.212	2.049	1.796	1.887	1.431	.945	.599	.379	.220	....
Mean Rainfall at same Station, 1844 to 1853, inclusive.													
Mean.....	4 63	4.03	2.25	2.22	2.23	4.07	4.32	4.77	3.79	5.07	4.64	3.94	45.96

MEAN EVAPORATION *from Earth, at Whitehaven, Cumberland, England,* 1844 *to* 1853, *inclusive.*

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Mean.....	.95	1.01	1.77	2.71	4.11	4.25	4.13	3.29	2.96	1.76	1 25	1.02	29.21
Ratio.....	.390	.415	.727	1.113	1 689	1.764	1.697	1.352	1 216	.723	.513	.419	....
Mean Rainfall at same Station, 1844 to 1853, inclusive.													
Mean.....	5.1	3.4	2.5	2.2	1.9	3.1	4.3	4.3	3.1	5.3	4.5	3.8	43.5

From these series of experiments made at Emdrup, in Denmark, at Bolton Le Moors, Lancashire, England, and at White Haven, Cumberland, England, it appears that at Emdrup the mean annual evaporation from short-grass land during a period of seven years was 30 inches. At Bolton, Le Moors, the mean annual rainfall was 46 inches, and the mean annual evaporation from the earth was 25.6 inches.

At White Haven the mean annual rainfall for 10 years was 43.5, and the evaporation from earth 29.2 inches. In other words, the mean annual evaporation from the earth at White Haven was 67 per cent of the mean annual rainfall, and at Bolton Le Moors it was about 56 per cent.

Charles Greaves, Esq., conducted a continuous series of observations upon percolation and evaporation at Lee Bridge, in England, between 1860 and 1873, and the results were given to the English Institution of Civil Engineers, and published in their Transactions in 1876, volume 45, page 33. The evaporation boxes were one yard square and one yard deep. Those for earth were sunk nearly flush in the ground, and those for water floated in the river Lee. The mean

annual rainfall for the time was 27.7 inches. The annual evaporations from soil were minimum 12.067 inches, maximum 25.141 inches, mean 19.534 inches.

From sand, minimum 1.425 inches, maximum 9.102 inches, mean 4.648 inches.

From water, minimum 17.332 inches, maximum 26.933 inches, mean 22.2 inches.

Thus we see that at Lee the evaporation from soil varied from a minimum of 44 per cent of the mean annual rainfall, to a maximum of 90 per cent of the mean annual rainfall during this period of 13 years. The average evaporation from soil was 70 per cent of the mean annual rainfall. From sand, however, there was a mean evaporation of only about 17 per cent. From the surface of water there was a mean annual evaporation of 80 per cent of the mean annual rainfall.

The results on the evaporation from the water surface correspond very closely with the observations made at the receiving reservoir in New York between the years 1864 and 1880, where the evaporation amounted to 80 per cent of the rainfall.

Amount of Reduction in Flow of Streams from the Cutting of Woods.

The facts here given show how great is the proportion of rainfall which, being carried off by evaporation, does not flow in the streams; also how very variable the evaporation is from year to year, ranging as it does from 26 to 75 per cent of the rainfall. They show, too, the great difference in the rate of evaporation during the different months of the year, the range in the Cochituate basin being from 20 per cent of the mean monthly rainfall of July and August to 84 per cent of the mean April rainfall.

The storage capacity of the water-shed, therefore, depends very largely upon whether the conditions of its surface are such as to promote or retard evaporation. Evaporation is different from different soils; but on any given surface it is increased by heat, dryness and wind. It is retarded when the soil is kept cool and the atmosphere above ground is moist and still.

The effect of woods of large trees is not only to keep the soil cool and moist, by shading it from the sun, but also to protect it from the drying effect of the wind. While I have not at hand the observations which have been made showing the difference in the rate of evaporation from wood lands, pasture lands and cultivated lands, the

results of these observations, as laid down in works on hydraulic engineering, seem to show that the change in the flow from water-sheds, made by the destruction of the woods, may lessen the quantity of water from 10 to 20 per cent of the annual rainfall.

If, therefore, on a given wooded water-shed the mean annual rainfall is 34 inches and the mean flow from the basin is 60 per cent of the rainfall, the water flowing off from the basin would be 20.4 inches.

Supposing that the removal of the woods from this area should reduce the flow of the basin 15 per cent of the rainfall, it would lessen the flow 5.1 inches and bring down the discharge of the basin to 15.3 inches of rainfall on its surface. It appears therefore that a reduction of 25 per cent in the flow of streams may take place when the land is changed from wood land to cleared land.

This example is illustrative of water-sheds of from 100 to 600 square miles. The mean annual flow from upland water-sheds of large rivers never amounts to 60 per cent of the mean annual downfall even when the slopes are wooded.

The statistics above given from Humphreys and Abbot's report on the Mississippi show that the annual flows of the streams mentioned vary from 15 to 25 per cent of the rainfall. One of the most careful investigations in regard to this matter was made in 1876 on the river Elbe, which drains the greater part of Bohemia. The rainfall was determined by observations at 72 points on the water-shed, and the annual flow of the river was found to be 25 per cent of the rainfall of that year. The average amount of water flowing in the channel was 5,300 cubic feet per second.

With large upland hydrographic basins it can hardly be supposed that, even under the most favorable circumstances as regards forest covering, more than 40 per cent of the rainfall would be discharged through the principal draining streams. With a mean annual rainfall of 40 inches, only 16 inches would flow in the main drainage channel. Should the evaporation be increased 10 per cent of the rainfall, only 12 inches of rain would flow in the streams, causing a reduction of 25 per cent of water in the larger channels.

This example more nearly represents what may happen to large rivers like the Mohawk and the Upper Hudson by the removal of woods from their water-sheds; especially as the greater part of the reduction in the flow is likely to take place during the driest parts of the year.

In a recent investigation by the State Board of Health into the changes in the flow of water in 18-Mile creek, in Niagara county, it appeared that owing to the removal of the greater part of the wood from the water-shed, the stream, which had formerly run throughout the year, is now dry during the latter part of the summer and early autumn.

I have entered thus at length upon the subject of the relation of rain to the flow of streams, because the subject is intimately connected with questions of water supply and drainage.

Flow from the Oak Orchard Water-Shed.

To plan an enlargement of the channel of Oak Orchard creek that would thoroughly drain the land, it was necessary to know how much water such a channel might be called upon to discharge at different seasons of the year and in different years. While the main creek might be allowed to run full in March and April, its water surface should be so low during the summer and autumn months as to permit of ready flow from the lateral branches draining into it. When water supply is required the question is, how much water will flow from a given water-shed in minimum and average periods. In planning drainage works, the question is looked at from the opposite side; and it becomes necessary to ascertain how much water a given water-shed will deliver into the drainage channels in times of floods, and during the different months of the year.

In the case of Oak Orchard basin, two questions were to be answered:

1st. What amount of rain may be expected to fall upon this basin during each month, and in different years?

2d. What proportion of this rain will be delivered into the creek, and what part may be expected to be carried off by evaporation?

Rainfall of the Region between Rochester and Buffalo.

No observations of the rainfall on the Oak Orchard basin have been made; but more or less extended records of rainfalls have been kept at Rochester and Buffalo, between which places the tract in question lies.

Rochester is about 25 miles east of the eastern end of Oak Orchard basin, and Buffalo is about the same distance south-westward from its west end. From the years 1871 to 1882 daily observations were taken at Buffalo and at Rochester by the Signal Service. They show

a mean annual rainfall during that period of 36.97 inches at Buffalo, and 37.23 at Rochester. The mean annual rainfall at Rochester during that time was therefore practically the same as at Buffalo, although the yearly rainfalls are not the same. As the Oak Orchard basin lies about half way between Rochester and Buffalo, covering nearly one-third of the distance between them; and as the average rainfall of these places is so nearly the same, it is probable that the yearly and monthly rainfall of Oak Orchard water-shed is about the mean of the rainfall at Rochester and Buffalo.

No one station can be trusted to represent the monthly rainfall of a large area. Local showers passing over the rain-gauge greatly vary the monthly precipitation at any point; while these changes may represent conditions covering but few square miles. With a drainage basin as large as that of Oak Orchard far more reliable results can be had from the average of two observing stations, situated as Rochester and Buffalo.

I have therefore given a table of the probable monthly rainfalls on the swamp water-shed, which is a mean of the monthly precipitation at Buffalo and at Rochester, from November, 1870, to May, 1883, inclusive.

The mean annual rainfall of Oak Orchard basin as thus determined during this period is 37.1 inches. The monthly rainfalls were as follows:

Table of probable Maximum, Minimum and Mean Rainfalls of Oak Orchard Basin, from November, 1870, to May, 1883, inclusive.

Month.	Minimum.	Maximum.	Mean.
January	1.22	6.35	2.96
February	0.46	5.28	2.55
March	1.37	6.28	3.20
April	0.96	4.21	2.53
May	0.87	6.49	3.11
June	1.86	4.44	3.07
July	1.18	6.31	3.55
August	0.20	5.97	2.94
September	0.75	5.02	2.79
October	0.70	7.50	3.77
November	2.12	4.87	3.29
December	1.06	7.36	3.30

The two greatest annual rainfalls of the period were 47.26 inches, in 1873, and 54.52 inches in 1878. The greatest monthly rainfalls were 7.5 inches in October, 1873, and 7.36 in December, 1878.

The mean rainfall of October was 3.77 inches. It is greater than that of any other month. Next in quantity is the rainfall of July, amounting to 3.55 inches. The mean total rainfall of the summer months is shown to be 9.56 inches, and of the spring months 8.84 inches.

I give also with the report a table, kindly furnished to us by the Signal Office at Washington, which shows the greatest daily precipitation in each month, both at Buffalo and at Rochester, from 1871 to 1882, inclusive.

The maximum amount of rain falling during 24 hours at either of these stations was 3.77 inches, which fell at Rochester in October, 1873. The maximum at Buffalo was 3.23 inches, on July 4th, 1871.

Rainfalls of two inches or more in 24 hours occurred 12 times at Buffalo and 9 times at Rochester during this period. The more usual maximum daily rainfalls at Rochester range from 2 to $2\frac{1}{2}$ inches.

It appears that in 1871, on the 4th of July, 3.23 inches of rain fell at Buffalo, and that on the 5th of July, 1871, 3.01 inches fell at Rochester. It is therefore likely that this heavy rainfall extended over a wide area. About three inches may be considered as probably the maximum amount of rain likely to fall over the whole of the Oak Orchard water-shed in 24 hours. Such rainfalls are, however, not likely to occur oftener than once in ten years. The maximum daily rainfalls of between two and three inches, during exceptionally wet seasons, may occur ten times in ten years. From 1871 to 1882 the greatest daily precipitations during the month, that exceeded two inches in amount, were as follows:

Table showing the Number of Cases at Buffalo and Rochester in which the greatest daily Rainfall of the Month Exceeded Two Inches.

At Buffalo in 1871, three cases.	At Rochester in 1871, one case.
" 1872, none.	" 1872, one case.
" 1873, two cases.	" 1873, three cases.
" 1874, none.	" 1874, none.
" 1875, one case.	" 1875, none.
" 1876, none.	" 1876, none.
" 1877, one case.	" 1877, one case.
" 1878, three cases.	" 1878, two cases.
" 1879, one case.	" 1879, one case.
" 1880, none.	" 1880, none.
" 1881, one case.	" 1881, none.
" 1882, none.	" 1882, none.

It appears therefore that a maximum daily precipitation of from two to two and a half inches is likely to be of comparatively frequent occurrence in the Oak Orchard basin.

The daily rainfalls above spoken of exceeding two inches, classified by months, occurred as follows:

At Buffalo	May, none.	At Rochester	none.
"	June, one.	"	one.
"	July, two.	"	two.
"	August, two.	"	two.
"	September, two.	"	none.
"	October, three.	"	two.
"	November, one.	"	none.
"	December, one.	"	two.
"	January, none.	"	one.
"	February, none.	"	none.
"	March, none.	"	one.
"	April, none.	"	none.

Out of the twelve at Buffalo, nine occurred between the first of July and the last of October; and out of nine at Rochester, six occurred during the same period. Although the maximum daily precipitations are thus shown to take place most frequently during July, August, September and October, yet at this time the soil and the air are so dry, and the power of the sun so great, that the water is carried off by absorption and evaporation rapidly enough to prevent a general flood in the large streams. It is for this reason that Oak Orchard creek has not overflowed its banks in summer, even with its present small and tortuous channel; while in the spring, when the ground is frozen and the atmosphere moist, it is almost always flooded, although the daily rainfalls are much smaller.

The table accompanying this report, showing Rochester monthly rainfalls from 1830, proves that the precipitation from 1870 to 1882 was greater than had ever before been known both in its annual and monthly amounts. Before this time, the greatest monthly rainfall recorded was 8.35 inches, which fell in June, 1830. Between 1830 and 1870 there is no record of any monthly rainfall exceeding $7\frac{1}{2}$ inches. During forty years the monthly rainfall only six times exceeded six inches.

During the ten years following 1870, a rainfall of eight inches was twice reached and exceeded, the maximum being 8.67 inches in October, 1873. The mean monthly rainfall during this period is, in

nearly every case, greater than the mean of the past fifty years. In determining maximum flows for purposes of agricultural drainage works, this period may therefore be taken as representing the extreme rainfall which must be provided for.

Percentage of Rainfall Flowing in Streams.

The next step in the investigation was to decide what percentage of the usual maximum rainfalls was likely to be received into the central channel of the basin and flow off through it during each month. There are no available records of continuous gaugings of streams in this State, showing the relation of the flow of the stream to the daily and monthly rainfall on the water-shed. Fortunately Massachusetts engineers have in several localities, by means of automatic gaugings of streams, combined with properly distributed observations of rainfall, obtained and published invaluable results in this matter. While these gaugings of Massachusetts streams are not exactly applicable to the water-sheds in the western part of the State, which differ from them both in topography and geological structure, yet some of them resemble western New York water-sheds sufficiently to guide us toward general conclusions as to the relation of rainfall to the flow of streams at different seasons of the year.

The most complete record to which I have had access, is that kept by the Boston water works of the daily yield of Sudbury river. The area of this water-shed is 77.76 square miles. The river rises in a district of low hills and flows afterward through an open valley with extensive swamp areas. From one-sixth to one-eighth is covered with woods, and the rest is agricultural land.

The average daily yield varies from 10,000,000 gallons to 350,000,000 gallons. Rain gauges were observed at five places on the water-shed for several years. The flow of the stream was recorded by an automatic gauge, and the resulting curves exhibit the height of the water in the river from 1875 to 1879, inclusive.

The diagrams published in the Transactions of the American Society of Civil Engineers, volume 10, 1881, show that during the months of March and April the flow from the Sudbury water-shed often equals, and sometimes exceeds, the total rainfall of those months, while during the summer months even phenomenal rains failed to raise the river to the maximum of spring floods or to a height approaching it.

Accompanying this report will be found reprinted the Sudbury river tables for the years 1875, 1876, 1877, 1878, 1879, giving the

inches of rain which flowed off from the water-shed, and the percentage of the total rainfall flowing off each month. The percentage of rainfall flowing off during February, March or April often appeared abnormally high, when the rainfall of the month was exceedingly small. The off-flow is really determined in these cases, not by the rain which fell during the month, but by the melting of snows which had been previously accumulating.

A critical examination of these tables shows that the discharge from the water-shed during March and April did not exceed the sum of the rainfalls during these months, plus two inches of rainfall, which is equivalent to 20 inches of melted snow.

The following are the combined rainfalls of March and April, compared with the amount flowing off from the Sudbury river water-shed during these two months:

Year.	March and April, rainfall.	March and April flow. from water-shed.
1875	7.0 in.	7.1 in.
1876	11.6	13.6
1877	12.6	12.7
1878	10.5	9.1
1879	9.9	9.5

From this table it appears that the usual flow from the water-shed of Sudbury river about equals the rainfall of those months; but that once during five years the off-flow exceeds the rainfall by two inches. This, as I have stated, was doubtless due to the melting of snow accumulated before the first of March.

An examination of the records also shows that the amount of water flowing off during the summer and early autumn does not compare with the discharge in spring, even when the rainfall is exceptionally large. In August, 1875, there was a rainfall of 5.5 inches, but only 0.7 inches flowed off into the river. In July, 1876, 9.1 inches fell, and only 0.3 inches flowed off. In October, 1877, 8.5 fell, and only 1.1 inches flowed off. In August, 6.9 inches fell, and 0.8 inches flowed off.

In speaking of the inches of water in connection with the flow of the rivers, I, of course, refer to the amount of rainfall on the water-shed represented by the water in the river.

In August, 1879, a remarkable precipitation occurred, 5.75 inches of rain falling in 24 hours; but the flow in the river was not nearly as large as the spring flow.

It will be noticed that the maximum monthly and daily rainfalls are larger on the Sudbury than on the Oak Orchard water-shed.

Rule for Determining the Size of Large Drainage Channels in Western New York.

After a careful review of the Sudbury, the Cochituate, the Croton, and other records of rainfalls and flows of streams, I am confident that any drainage channel large enough to carry off from its water-shed, during the months of March and April, the maximum amount of rain falling during those months, together with the water from the melting snow accumulated before March first, will be capable of discharging the largest daily or monthly rains which may occur between May and November.

In constructing drainage canals in the western part of the State, I think the following rule may be laid down: The water-way should be capable of discharging by the first of May all the rainfall of March and April, together with water from the melting of snow accumulated on the water-shed on the first of March.

With an outfall channel of this capacity there can be no danger of overflowing the surrounding lands after the first of May. Any year when a maximum spring rainfall occurs, together with large accumulations of snow in March, a channel planned on this rule might run full to its brim during March and April, or might under certain circumstances be liable to overflow late in March and early in April; but from the first of May onward the water flowing in the channel would steadily fall. The May and June flow is not likely to be over half that of March and April, and the flow of July, August and September is not likely to be more than a quarter of the spring flow.

The flow of October and November will probably be one-half to one-third of that of the spring flow.

This lowering of the water surface during late spring, summer and autumn in the principal outfall channel greatly facilitates the discharge of the lateral ditches in the season when it is necessary thoroughly to drain adjacent lands for agricultural purposes.

As proof that the rule above given is safely applicable to the Oak Orchard water-shed, I may add that the present channel of the stream has not for many years overflowed its bank during the summer and early autumn, except in 1869, when a flood occurred in September. An examination of the rainfalls of that year shows that this flood was the result of a succession of remarkable monthly rainfalls. The average rainfall of June, July, August and September is about 3 inches each month; but in 1869 there fell in June 6.62 inches, in July 4.90, in August 4.60, in September 5.11, making a rainfall of 21.23 inches in four months. This remarkable and continuous preci-

pitation doubtless so saturated the ground and the air, that a very unusual amount flowed off from the water-shed and caused the flood. No similar rainfall has ever been recorded during these four months in this region. Even in this exceptional case, a channel capable of discharging a maximum spring rainfall would have freed the water-shed from all surplus water.

The rule having been determined upon by which to compute the amount of water liable to be discharged by Oak Orchard creek, I have appended a table of the March and April rainfalls and their sum, at Rochester, from 1830 to 1883, which shows that the maximum spring rainfalls occurred between 1870 and 1882. Before 1870 the records show that in only three instances the March and April rainfall reached and exceeded 7 inches. In 1852 it was 7.54 inches; in 1857, 7.66; in 1862, 7.28 inches; but between 1870 and 1879, within nine years, it five times exceeded 7 inches. In 1873 occurred the greatest March and April rainfall, 11.73 inches

This decennial period, from 1870 to 1880, being one of maximum spring rainfalls, it may be taken as a reliable basis for computing the maximum spring flows from water-sheds in that part of the State. The spring flow of the Oak Orchard basin will, however, be most nearly represented by the mean of the rainfall of Rochester and Buffalo.

An appended table shows the March and April rainfalls of Buffalo and Rochester and their mean. For all practical purposes the following table may be accepted as showing the amount of rain falling in March and April, in the Oak Orchard basin, from 1871 to 1883, inclusive:

Tables of Rainfalls of March and April combined, from 1871 *to* 1883, *on Oak Orchard Water-Shed.*

	Inches.
1871	6.87
1872	3.69
1873	10.42
1874	5.70
1875	3.65
1876	6.61
1877	6.68
1878	9.21
1879	3.73
1880	4.66
1881	5.49
1882	4.39
1883	3.34

Previous to this period it is to be remembered that 7.66 inches was the greatest amount of rain recorded as falling in March and April in this part of the State. I have therefore assumed 8 inches as the amount of rainfall which the channel of Oak Orchard creek should be able to discharge, together with two inches of water which might come from the melting of 20 inches of snow accumulated on the water-shed March 1st. It is not probable that a channel which is calculated to carry off in two months an equivalent of 10 inches of rainfall over the whole of Oak Orchard water-shed, would ever overflow its banks, except possibly in late March and early April.

The facts above given show that a channel capable of carrying off, in two months, 10 inches of rainfall on the surface of the Oak Orchard basin, will undoubtedly drain that tract, and with proper lateral branches prevent all flooding of the surface. That this canal is not too large for the purpose, is shown by the table above given of the total rainfalls of March and April, from 1870 to 1880.

I have, it will be remembered, assumed eight inches as the March and April rainfall to be discharged. Five times during the above period the March and April rainfall nearly reached or exceeded seven inches. Twice it exceeded nine inches. I am informed through a number of sources that it is not unusual to have 20 inches of snow accumulated on the Oak Orchard basin on the first of March.

It is therefore quite probable that, during the ten years above spoken of, a canal capable of carrying off eight inches of rainfall and 20 inches of accumulated snow would have been filled to its maximum capacity several times. Certainly any smaller channel would have been in great danger of overflow.

It is not desirable to plan a channel which shall often be filled to its brim. It is much better that under ordinary conditions, even in early spring, the water surface should be a foot or more below the surrounding lands, to facilitate their drainage.

Having therefore decided that to secure the drainage of the Oak Orchard basin, it is necessary that its central channel should be prepared to receive an amount of water equivalent to 10 inches of rainfall over the whole tract, I have divided the water-shed into districts covering areas of lateral drainage into the central channel, and computed the amount of water which would enter the main stream at various points through its branch water courses.

There are nine of these districts; and, since the slope of the central channel is from east to west, the flow from each district at the most

western point of its discharge is taken as the quantity of water which will flow in the central channel at that part of its course. The districts have the following areas: The first, being at the upper or eastern end of the basin, contains 20,776 acres; the second 13,220; the third 19,960; the fourth 10,152; the fifth 11,416; the sixth 10,248; the seventh no acreage; the eighth 657; the ninth 2,143; making the total of 88,572 acres.

The first district ends near the new Oak Orchard road; the second near the Mechanicsville road; the third below Boorham's bridge; the fourth at Knowlesville road; the fifth at the State road bridge; the sixth at Coon's bridge; the seventh at the beginning of the rock cut; the eighth and ninth are between this point and Shelby Centre.

The amount of water liable to be discharged in time of flood into the central Oak Orchard channel by the upper or first district is 145 cubic feet per second; the second will discharge 93 cubic feet per second; the third, 140; the fourth, 71; the fifth, 80; the sixth, 72; the seventh, nothing; the eighth, 5; the ninth, 15.

PLAN FOR THE RECTIFICATION OF OAK ORCHARD CREEK CHANNEL.

Assistant Horace Andrews, Jr., has prepared the plans and sections for such an enlargement and straightening of the Oak Orchard channel as to give it capacity to carry off the amounts of water above given, which are liable to be discharged into it in time of flood.

Having determined the amount of water that the channel must carry at various points along its course, the next point was to decide upon the course of the channel. No surveys have been made of sufficient detail to warrant a final determination of the best course for the channel; but the one shown on the accompanying map is probably a close approximation to what will prove to be the best line after final survey.

Down to Boorham's bridge very little change will need to be made in the line of the present stream. Deepening to the proper grade, and widening at certain points, is all that will be required. But from Boorham's bridge to the State road so many abrupt bends are cut off, that, while for the greater part of the distance the present Oak Orchard channel is followed, the line shown in the plan for the rectified channel is only $6\frac{1}{2}$ miles between the points named, although by the present tortuous stream the distance is $9\frac{3}{4}$ miles.

The straight line distance from Boorham's bridge to the State road is only about $5\frac{1}{2}$ miles, so that a further straightening of the

channel may easily be made, if not too expensive. From the State road to Coon's bridge the rectified channel would follow the line of the ditch, or cut-off, which was made several years ago, but through which very little water now passes.

The distance by the rectified channel from the State road to Coon's bridge, as the water now flows through the old channel of Oak Orchard creek, is between two and a half and three miles, while by the new channel it would be only two miles.

The shortening of the channel between Boorham's bridge and the State road, increases the fall from one foot per mile to one and a half. The velocity of the current between the State road and Coon's bridge, in the new channel, would be twice the present flow; so that from Boorham's bridge to Coon's bridge the discharge would be more than doubled by simply straightening the course according to the proposed plan.

The determination of the course of the new channel fixes its fall per mile. Just below Coon's bridge the new channel is joined by the canal feeder from Tonawanda creek. In the plan herewith given, this feeder is supposed to bring down no Tonawanda water in the time when Oak Orchard creek is in flood; but it is arranged to act as a drain for the sixth district, and to discharge into the main channel about 72 cubic feet of water per second.

During November last this feeder was discharging about 130 cubic feet of water per second from the Tonawanda into Oak Orchard creek.

The proper depth for the new channel is, in my judgment, 6 feet. Borings made along its course show that there is no rock found within 10 feet of the surface east of Coon's bridge. These borings prove that all excavations will be in thes urface muck and underlying clay. A depth of 6 feet in the central channel is required in order to reduce the late spring and summer water surface in the canal low enough to admit of free flow from the lateral ditches draining into it. The water in the lateral drains must be kept down at least three feet below the surface of the ground, between May and October, in order to permit thorough drainage of the lands. To accomplish this it will be necessary to lower the bottom of the main creek 6 feet below the surface. A channel of less depth will fail of the desired purpose of thoroughly draining the swamp and carrying off the water discharged from the uplands.

On the valley parts of the swamp, above Boorham's bridge, the slope

from its northern edge toward the creek is very gentle, being hardly four feet in two miles; lateral drainage ditches would not discharge properly down such a slope. The summer water level in the new channel at this point will probably be about four feet below the surface of the ground. Such a level would give a fall of 8 feet in two miles for draining the swamp lands on the north side of Oak Orchard creek; but any less than 6 feet depth to the main channel would be insufficient.

At the State road, in the towns of Alabama and Shelby, where the main swamp on the south side of Oak Orchard creek is nearly two miles broad, the fall of the surface from the edge of the swamp to the creek is about 4½ feet. The slope of the water surface in the drains at this point would, with the new channel, be increased so as to double their capacity for discharge, thus insuring thorough drainage for the lands in Alabama and Shelby.

Six feet is therefore assumed as the proper depth of the canal until it reaches the rock cut; and this depth is measured below an assumed water surface, having the same elevation as the surface of the ground. The elevation of the water surface and the bottom are given on the accompanying profile. Below Coon's bridge and through the rock cut we have assumed the water surface higher than the water in the channel was during October and November of the present year. The water in the feeder at that time was about two feet below the level of the surrounding land. The elevation of the ground at Coon's bridge is about 610 feet, while the water surface was about 608 feet. Through the upper part of the rock cut we also allow for a rise in the surface of the water one foot in time of maximum discharge. Such rise in the water surface during March and April will not injure the surrounding lands; and, owing to the deepening of the rock channel, their condition will be much improved during the rest of the season.

Experience in this part of the State seems to show that slopes of two to one are on the whole best for the sides of large water channels. The canal feeders are so designed. I have therefore adopted slopes of two to one as being in this soil likely to be most enduring. Having determined the volume of water to be carried, and the fall per mile; and having assumed a uniform depth of 6 feet through the channel, and side slopes of two to one, the top and bottom width of the new channel have been computed at nine points along its course, namely at the lower end of each district mentioned.

Between these determined points the channel is planned to increase in breadth at a uniform rate. The results are given in an accompanying table, and are graphically shown in the profile appended to this report. The table gives the areas of each district of the water-shed; the lengths of the divisions of canal through each district; the total fall in this distance; the cubic feet of water to be discharged per second from the water-shed; the carrying capacity of the canal at the end of each division, in cubic feet of water per second; the area of the cross section of the canal; and its breadth at top and bottom at the end of each division.

Cost of Draining Oak Orchard Swamp.

An estimate is also added of the amount of excavation required in the construction of the channel. The table gives the cubic yards to be moved if the canal were to be entirely excavated from unbroken ground; and also an estimate of the reduction in this amount to be made owing to the partial use of the present channel. To this is added an estimate of the cost of constructing each division.

The total length of the channel is 107,712 feet. Its top breadth increases from 24 feet at the upper end in the town of Barre, to 39½ feet at the State road, and about fifty feet at Coon's bridge. The total cost is estimated at $90,388, to which is added 25 per cent for contingencies; making a total probable cost of $112,985.

This estimate cannot from the nature of things be exact in its quantities. In sections 2, 3, 4, 5 and 6 it is assumed that the excavation of the proposed channel will be six-tenths of the total quantity that would be required had the present channel not existed. Nor is it exactly known for what price per cubic yard the earth and rock could be moved. The estimate must therefore be considered as giving only approximately the probable cost of the work.

Capacity of the Present Channel.

The present channel of Oak Orchard creek between the State road and Boorham's bridge is 9¾ miles and has a fall of a foot to the mile. Its average width is about 26 feet, and its average depth about 3½. The average area of the cross section is about 73 square feet; but in places the depth of the stream is only two and a half feet, while in others the width narrows to 20 feet.

The minimum cross section is probably from 50 to 54 square feet. A straight channel 9¾ miles long, with a fall of a foot to the mile, a

top width of 26 feet, a depth of 3½ feet, and cross section of 73 square feet, would be capable of discharging about 148 cubic feet of water per second. The discharge through the present tortuous channel, whose water-way sometimes diminishes to two-thirds the average size, must be much less than the figure above mentioned. Its capacity probably does not exceed 120 cubic feet per second, while the discharging capacity of the new channel at the State road is 529 cubic feet per second, or more than four times that of the present Oak Orchard creek.

CAUSE OF OAK ORCHARD SWAMP AND MEANS FOR ITS RECLAMATION.

Since the new channel would probably be none too large to carry off the maximum flow of Oak Orchard creek in March and April, it follows that the present channel is not large enough to carry one-fourth of the water which may flow from the basin above the State road. The result is that the remaining three-fourths of the flood water spreads over the lower lands, creating a swamp.

The cause of the floods and the swamp is therefore apparent, and the remedy is simple. The spring rainfall far exceeds the carrying capacity of the natural drainage channels.

Relief can only be had by enlarging the water-ways sufficiently to discharge the flow from the water-shed. With such enlargement of the channel of Oak Orchard creek, which flows along the central valley of the basin, secondary and tertiary ditches may be opened through every part of the swamp with the result of lowering the ground-water to some three or four feet below the surface of the ground from May to November. The 23,000 or 25,000 acres of waste swamp, now worthless for agriculture, and most injurious to the health of the surrounding country, may thus be converted into fruitful fields, and the value of the property be increased from a million to a million and half dollars. In addition, outfall will be provided for the drainage of all the lateral basins which lie upon the slopes of the Oak Orchard water-shed, which, if they were now to be drained, would pour their waters down into the low lands in the central part of the basin, to the damage of these districts. Until this common outfall is provided for the whole basin, but little improvement in its condition can be expected.

Respectfully submitted.

JAMES T. GARDINER,

Director New York State Survey.

LETTER TO THE STATE BOARD OF HEALTH.

To the State Board of Health:

GENTLEMEN—The accompanying copy of the special report of the Director of the State Survey on the Topography, Hydrography and Drainage of Oak Orchard Swamp and Basin, approved by the Commissioners, is herewith transmitted to you in response to your application of April last.

Very respectfully yours,

WILLIAM DORSHEIMER,

President of the Board of Commissioners of the State Survey.

TABLES ACCOMPANYING SPECIAL REPORT

ON THE

TOPOGRAPHY, HYDROGRAPHY AND DRAINAGE

OF THE

Oak Orchard Swamp and Basin.

TABLE No. 1. — Monthly Precipitation at Rochester, in inches.

YEAR.	January.	February	March.	April.	May.	June.	July.	August.	Septem.	October.	Novem.	Decem.	Total.	Decennial Means.
1830	1 68	.22	3.42	1.32	3.51	8.35	1.99	1.91	3.93	1.04	4.70	2.12	34.19	
1834	.11	.73	.78	1.60	.91	1.61	1.45	1 38	1.89	4.06	1.99	.53	17.04	
1835	1.15	.81	.60	4.46	.79	5.49	1.83	3.57	2.63	4.56	2.25	.46	28.60	
1836	2.40	.59	.55	1.70	6.12	2.77	2.74	1.29	2.30	2.66	3.25	1 58	27.95	27. 7
1837	.16	2.50	3.00	.50	2.82	2.58	1.11	3.72	2.34	5.10	4.16	2.62	30.61	
1838	1.70	1.70	1.24	2.14	4.91	1.33	3.04	2.59	.87	3.20	1.68	1.06	25.46	
1839	2.40	2.05	1.55	2.48	4.90	3.40	4.20	3.56	1.19	.56	2.82	1.18	30.09	
1840	1.16	1.37	1.40	2.22	4.13	2.63	3.11	4 09	2.81	2.83	1.71	1.93	29.39	
1841	2.13	.21	3.55	3.27	1.17	1.29	4.58	1.60	6.14	1.21	4.65	2.53	32.33	
1842	1.13	2.12	2.89	2.48	2.18	3.66	3.69	1.42	5.19	2.20	3.43	2.80	33.19	
1843	2.79	2.62	2.09	2.22	1.83	2.93	2.12	.70	5.52	4.42	1.07	1.90	30.21	
1844	2.21	.37	1.14	.72	4.18	3.19	3 30	1.74	.68	4.81	2.19	1.64	26.17	32.29
1845	3.51	2.01	2.62	2.49	2.65	4.48	2.75	2.77	4.32	2.84	2.58	1.42	34.44	
1846	2.18	2.92	1.53	1.18	2.34	4.96	2.49	3.85	2.76	6.79	3·61	2.52	37.13	
1847	3.01	3.71	.92	2.65	1.73	2.65	2.05	5.27	4.25	4.94	3.65	1.31	36.14	
1848	2.25	1.04	1 77	.78	4.48	2.13	6.16	2.78	2.96	1.77	1.80	4.11	32.03	
1849	1.39	1.29	2.35	1.44	3.81	4.33	.94	3.62	3.91	4.17	3.31	2.31	32.87	
1850	3.07	1.95	2.55	2.58	2.87	1.84	5.97	1.93	2.95	5.16	3.44	5.28	39.58	
1851	1.36	2.00	1.38	1.16	2.21	no record	3.58	1.54	1.06	2.14	3.93	2.70	(26.37)	
1852	1.57	2.08	3.21	4.33	2.08	4.39	4.09	1.33	2.97	3.89	2.86	2.50	35.30	
1853	2.47	2.87	2.30	3.25	4.55	1.48	1.00	2.01	6.83	2 57	2.34	1.72	33.39	
1854	1.81	2.86	1.07	3.54	2.15	5.47	.25	.90	5.18	1.64	1.48	3.25	29.60	33.4
1855	3 33	1.46	1.49	2.05	1.96	5.55	5.27	2.63	1.80	4.84	1.06	2.48	33.92	
1856	1.94	.77	1.92	2.33	2.48	1.90	1.80	2.70	3.52	1.00	1.33	2.68	24.37	
1857	1.92	3 52	1.99	5.67	3.72	5.19	3.58	2 74	1.91	4.22	3.96	4.37	42.79	
1858	1.58	2.38	1 47	2.85	3.40	3.40	4.66	3.28	3.19	.86	5.70	3.48	36.25	
1859	1.37	1.07	2.49	4.03	2.71	1.17	4.16	5.14	2.86	1.21	1.93	4.46	32.60	

1860	1.09	1.35	1.64	1.80	1.41	3.78	4.50	2.50	3.52	4.71	3.37	1.53	31.20	
1861	2.48	2.98	1.55	3.25	3.88	1.37	5.11	2 50	6.09	2.81	1.41	1.38	34.81	
1862	3 51	2.82	5.15	2.13	2.05	4.44	4.13	2.22	2.36	3.98	2.46	2.34	37.59	
1863	2.23	2.44	3.49	2.79	1.83	1.37	5.03	3.70	1.51	2.72	2.97	2.63	32.71	
1864	2.91	1.18	3.44	3.23	6.54	1.57	1 66	5.49	1.83	5.51	2.66	4.82	40.84	35.93
1865	2.83	1.74	3.17	3.03	3.30	5.43	1.47	1.04	4 33	4.29	1 70	1.75	34.08	
1866	1.48	2.39	2.71	3.20	2.90	3.90	1.36	4.91	4.11	1.22	3.29	3.22	34.69	
1867	2.68	3.01	2 08	2 93	5.69	1.40	3.54	.72	2.28	1.92	no record	no record	(31.79)	
1868	1.45	1.59	4.38	1.86	6.36	2.87	.68	3.22	7.51	1.67	4.42	3.23	39.24	
1869	1.35	4.13	2.27	1 47	2.56	6.62	4.90	4.60	5.11	2.83	3.58	3.38	42.80	
1870	3.40	3.38	4.66	2.75	.78	no record	4.72	no record	5.01	no record	2.22	4.12	(40.38)	
1871	1.76	2.94	3.34	3.17	1.69	4.40	3.25	5.47	0.51	2.03	3.40	1.93	33.89	
1872	2.40	1.28	2.50	2.15	2 18	5.35	2.56	1.89	1.72	8.14	2.07	4.05	36.29	
1873	3.33	1.52	7.02	4.71	3.52	1.86	5.44	3.01	2.97	8.67	3.24	4.60	49.89	
1874	5 47	3.35	2.90	4.99	2.98	2.75	4.37	0.84	2.73	2.17	2.07	1.00	35.62	38.00
1875	1.19	1.21	1.92	1.99	2.76	3.33	2.12	5.08	2.87	2 41	2.14	2.91	29.93	
1876	4.27	5.40	3.89	1.99	1.55	3.33	4.59	0.36	5.69	1.26	1.77	1.72	35.82	
1877	3.10	0.46	3.55	2.67	1.20	3.16	4.42	2.98	2.31	3.06	5.46	1.75	34 12	
1878	8.05	4.84	4.89	3.17	2.25	1.69	3.72	3.24	1 35	3 83	5.07	6.17	48.81	
1879	3.53	3.27	2.53	1.44	1.35	3.73	4.61	3.47	2.80	0.67	4.47	3.35	35.22	
1880	2.07	3.82	2.57	2.12	5.54	2.45	3.49	5.53	2.72	5.31	3.19	2.99	41.80	
1881	4.68	2.86	5.33	1.15	5.86	3.20	2.20	1.44	1.82	3 63	1.96	4.11	38.24	
1882	2.04	1.25	1.74	2.18	5.57	2.50	1.17	2.73	0.82	0.62	2.01	2.10	24 73	
Mean.....	2.38	2.13	2.56	2.52	3.09	3.31	3.22	2.80	3.16	3.23	2.89	2.65	33.93	

NOTE.—From 1830 to 1871, the observations were made at the Rochester University, and from 1871 to June, 1883, at the U. S. Signal Service station, in Powers Block. At the latter date the station was discontinued.

In 1851, 1867 and 1870, where the record was defective in certain months, the mean precipitation for the months in question was used in making out the annual amount.

1871—University ...	1.60	2.63	2.88	2.75	1.70	4.20	3.00	4.90	0.50	1.55	3.70	20 5	31.46
1871—Signal Serv .	1.93	3.25	3.80	3.59	1.68	4.60	3.49	6.05	0.51	2.52	3.10	1.82	36.31

TABLE No. 2.

ROCHESTER, N. Y.

Monthly Precipitation, in inches.

YEAR.	Janu'ry.	Feb'ry.	March.	April.	May.	June.	July.	August.	Sept'ber.	October.	Novem'r.	Decem'r.	Annual amount.
1870	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2.22	4.12	.....
1871	1.93	3.25	3.80	3 59	1.68	4.60	3.49	6.05	0.51	2.52	3.10	1.82	36 34
1872	2.40	1 28	2.50	2.15	2.18	5.35	2.56	1 89	1.72	8.14	2.07	4.05	36 29
1873	3.33	1.52	7.02	4.71	3.52	1.86	5.44	3.01	2.97	8.67	3.24	4.60	49.89
1874	5.47	3.35	2.90	4.99	2.98	2.75	4.37	0.84	2.73	2.17	2.07	1.00	35.62
1875	1.19	1.21	1.92	1.99	2.76	3.33	2.12	5.08	2.87	2.41	2.14	2.91	29.93
1876	4.27	5.40	3 89	1.99	1.55	3.33	4.59	0.36	5.69	1.26	1.77	1.72	35.82
1877	3.10	0.46	3 55	2.67	1.20	3.16	4.42	2.98	2.31	3.06	5.46	1.75	34.12
1878	8.05	4.84	4.89	3.71	2.25	1.69	3.72	3.24	1.35	3.83	5.07	6.17	48 81
1879	3.53	3.27	2.53	1.44	1.35	3.73	4.61	3.47	2.80	0.67	4.47	3 35	35.22
1880	2.07	3.82	2.57	2.12	5.54	2.45	3.49	5.53	2.72	5 31	3.19	2.99	41.80
1881	4 68	2.86	5 33	1.15	5.86	3.20	2.20	1.44	1.82	3.63	1.96	4.11	38.24
1882	2.04	1.25	1.74	2.18	5.57	2.50	1.17	2.73	0.82	0.62	2.01	2 10	24.73
1883	0.94	2.28	1.65	1.61	6.53	.....	.....	.....	.....	.....	.....	.....	.....
Mean	3.31	2.68	3.41	2.64	3.31	3.16	3.52	3.05	2.36	3.52	2.98	3.13	37.23

TABLE No. 3.

Buffalo, N. Y.

Monthly Precipitation, in inches.

YEAR.	Janu'ry.	Feb'ry.	March.	April.	May.	June.	July.	August.	Sept'ber.	October.	Novem'r	Decem'r.	Annual amount.
1870	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	2.95	2.88	.....
1871	0.50	1.88	3.28	3.07	1.77	3.94	3.29	5.90	0.98	1.64	3.60	2.55	32.40
1872	1.94	2.21	1.30	1.43	2.23	3.52	1.66	1.94	4.34	4.36	4.29	2.03	31.25
1873	1.68	1.42	5.54	3.58	2.53	1.87	7.19	3.44	2.59	6.34	3.89	4.56	44.63
1874	5.61	2 42	1.08	2.44	3.04	1.50	4.64	0.46	3.39	2.12	2.62	1.12	30.44
1875	1.46	1.26	1.87	1.52	3.37	2.88	3.42	3.45	4.09	3.04	2.09	2.99	31.44
1876	3.49	5.16	4.09	3.28	1.45	1.24	4.77	0.05	4.35	3.56	4.47	3 35	39.26
1877	2.19	0.46	4.91	2 24	0.53	4.86	1.85	2.95	2.55	6.17	4.27	1.50	34.48
1878	4 64	1.70	5.11	4.71	3.36	3.46	6.80	3.17	7.44	6 .6	4.44	8.55	60.24
1879	3.42	2.82	2.13	1.36	1.11	2.48	2.68	3.62	2.52	0.74	4 28	3.31	30.47
1880	1.68	3.51	2.11	2 53	3.05	2.97	3.31	6.07	2.96	4.87	3.17	3.03	39.26
1881	2.31	2.43	3.74	0.76	2.18	4.15	2.17	0.85	1.21	7.33	2.96	5.86	35.95
1882	3.29	2.16	2.63	2.23	6.89	2.96	1.19	2.04	2.21	1.10	3 73	3.39	33.82
1883	1.69	4.04	1.08	2.34	6.45	5.46	3.35	2.30	2.11	3.58	2.93	.....	.....
Mean	2.61	2.42	2.99	2.42	2.92	3.18	3.56	2.79	3.13	3.98	3.55	3.47	36.97

TABLE No. 4.

Monthly Rainfall, in inches, on Oak Orchard Swamp Water-Shed, assumed to be Mean of Buffalo and Rochester Gauges.

YEAR.	January.	Feb'ary.	March.	April.	May.	June.	July.	August.	Sept'ber.	October.	Novem'r.	Decem'r.	Annual amount.
1870	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2.58	3.50	.....
1871	1.22	2.56	3.54	3.33	1.72	4.27	3.39	5.97	0.75	2.08	3.35	2.19	34.37
1872	2.17	1.75	1.90	1.79	2.20	4.44	2.11	1.92	3.03	6.25	3.18	3.04	33.77
1873	2.50	1.47	6.28	4.14	3.03	1.86	6.31	3.23	2.78	7.50	3.57	4.58	47.26
1874	5.54	2.89	1.99	3.71	3.01	2.13	4.50	0 65	3 06	2.15	2.34	1.06	33.03
1875	1.33	1.23	1.90	1.76	3.07	3.10	2.77	4.27	3.48	2 73	2.12	2.95	30.68
1876	3.88	5.28	3.99	2.63	1.50	2.29	4.68	0.20	5.02	2.41	3.12	2.53	37.54
1877	2.64	0.46	4.23	2.45	0.87	4.01	3.14	2.97	2.43	4.61	4.87	1.63	34.30
1878	6.35	3.27	5.00	4.21	2.80	2.58	5.26	3.20	4.40	5.34	4.76	7.36	54.52
1879	3.47	3 05	2.33	1.40	1.23	3.10	3.65	3.54	2.66	0.70	4.38	3.33	32.85
1880	1.87	3.67	2.34	2 33	4.30	2.71	3.40	5.80	2.84	5.09	3.18	3.01	40.53
1881	3.50	2.65	4.54	0.96	4.02	3.68	2.18	1.15	1.52	5.48	2.46	4.98	37.09
1882	2.07	1.70	2.18	2.21	6.23	2.73	1.18	2.38	1.52	0.86	2.87	2.75	29.27
1883	1.32	3.16	1.37	1.97	6.49	.....	.....	.....	.....	.....	.....	.....	.....
Mean	2.96	2.55	3.20	2.53	3.11	3.07	3.55	2.94	2.79	3.77	3.29	3.30	37.10

TABLE No. 5.

Table showing the Amount of Rainfall during March and April at Rochester and Buffalo.

Rochester.

YEAR.	March.	April.	Sum.	YEAR.	March.	April.	Sum.
	Inches.	Inches.	Inches.		Inches.	Inches.	Inches.
1830	3.42	1.32	4.75	1852	3.21	4.33	7.54
1834	.78	1.60	2.38	1853	2 30	3.25	5.55
1835	.60	4.46	5.06	1854	1.07	3.54	4.61
1836	.55	1.70	2.25	1855	1.49	2.05	3.54
1837	3.00	.50	3 50	1856	1.92	2.33	4.25
1838	1.24	2.14	3 38	1857	1.99	5 67	7.66
1839	1.35	2.48	3.83	1858	1.47	2.85	4.32
1840	1.40	2.22	3.62	1859	2.49	4.03	6.52
1841	3 55	3.27	6.82	1860	1.64	1.80	3.44
1842	2.89	2.48	5.37	1861	1.55	3.25	4.80
1843	2.09	2.22	4.31	1862	5.15	2.13	7.28
1844	1.14	.72	1.86	1863	3 49	2.79	6.28
1845	2.62	2.49	5.11	1864	3 44	3.23	6.67
1846	1.53	1.18	2.71	1865	3.17	3.03	6.20
1847	.92	2.65	3 57	1866	2.71	3.20	5 91
1848	1.77	.78	2 55	1867	2.08	2.93	5.01
1849	2.35	1.44	3 79	1868	4.38	1.86	6.24
1850	2.55	2.58	5 13	1869	2.27	1.47	3.74
1851	1.38	1.16	2.54	1870	4.66	2.75	7.41

YEAR.	Rochester. March.	Rochester. April.	Rochester. Sum.	YEAR.	Buffalo. March.	Buffalo. April.	Buffalo. Sum.	Mean of R. & B.
	Inches.	Inches.	Inches.		Inches.	Inches.	Inches	Inches.
1871	3.80	3.59	7.39	1871	3.28	3.07	6.35	6.87
1872	2.50	2.15	4.65	1872	1.30	1.43	2.73	3.69
1873	7.02	4.71	11.73	1873	5.54	3.58	9.12	10.42
1874	2.90	4.99	7.89	1874	1.08	2.44	3 52	5.70
1875	1 92	1.99	3.91	1875	1.87	1.52	3.39	3.65
1876	3.89	1.99	5.88	1876	4.09	3.28	7.35	6.61
1877	3.55	2.67	6.22	1877	4.91	2.24	7.15	6.68
1878	4.89	3.71	8.60	1878	5.11	4.71	9.82	9.21
1879	2.53	1.44	3.97	1879	2.13	1 36	3.49	3.73
1880	2.57	2.12	4.69	1880	2.11	2.53	4.64	4.66
1881	5 33	1.15	6.48	1881	3 74	0.76	4.50	5.49
1882	1.74	2.18	3.92	1882	2.63	2.23	4.86	4.39
1883	1 65	1.61	3.26	1883	1.08	2.34	3.42	3.34

The mean of the rainfalls of Rochester and Buffalo is assumed as the March and April precipitation on the Oak Orchard basin.

TABLE 6.

ROCHESTER.

Maximum Daily Precipitation in each Month.

YEAR.	Janu'ry.	Feb'ry.	March.	April.	May.	June.	July.	August.	Sept'ber.	October.	Novem'r.	Decem'r.
1871	0.62	1.00	1 35	0.63	0.84	1 20	1.94	3.01	0.36	1.13	1.02	0 34
1872	0.72	0.38	0.67	0.50	0.44	2.28	0.79	0.59	0.55	1.74	0.06	0.70
1873	0.50	0.58	2.01	1.15	0.86	0 62	2.10	1.16	1.45	3.77	0.76	0 98
1874	1.37	0.91	0.53	1.31	1.02	1 16	1.75	0 26	0.90	0.62	0.53	0 49
1875	0 19	0.43	0.93	0.55	0.58	0.69	0.69	1.90	1.29	0.78	0 68	0.59
1876	0.84	1.46	0.97	0.42	0.45	1.67	0.90	0.25	1 30	0.21	0.29	0 31
1877	1.21	0.22	0.67	1.05	0 70	0.69	2.05	1.13	0.73	0.95	1.15	0.92
1878	2.11	1.45	1.56	0.85	0.71	0.65	1.49	1.14	0.30	2.34	1.87	1.64
1879	1.71	0.91	0 57	0.21	0.62	1.29	1.27	2.65	0.82	0.25	1.46	0.67
1880	0.77	1.37	0.38	0.58	1 77	0.46	0 75	1.75	0.88	1 90	0.76	0.46
1881	0.90	0.76	1.52	0.60	1.30	0.68	0.79	0.69	0.83	0.61	0.67	0 88
1882	0.50	0.49	0.55	0.62	1.10	0.88	0.56	1.24	0.47	0.40	0.50	0.46
Mean	0.95	0.83	0.97	0.71	0 87	1.02	1.26	1.31	0 82	1.23	0.85	0.70

TABLE No. 7.

Buffalo.

Maximum Daily Precipitation in each Month.

YEAR.	January.	February	March.	April.	May.	June.	July.	August.	Septem'r	October.	Novem'r.	Decem'r.
1871	0 39	0.71	0.78	0.28	0.72	2.10	1.22	3.23	0.69	0.80	2.53	0 54
1872	0.70	1.76	0.49	0 68	0.44	0.98	0.88	0.93	1.37	0.94	1.32	0.36
1873	0 44	0.41	1.38	0.87	0 92	0.75	2.73	1.08	0 84	2.45	0.61	1.13
1874	1.74	0.68	0.62	0.66	1.29	0.46	1.11	0.20	1.23	0.68	0.81	0 42
1875	0.25	0.45	0.72	0.30	0 85	0.77	0.93	1.42	2.36	0.71	0.70	0.93
1876	0.67	1.59	0.75	0.81	0.34	0.39	1.53	0.04	1.68	0.84	1.24	0 67
1877	0.86	0.25	1.46	1.40	0.49	1.32	0.54	0.94	1.29	2.03	0.90	1 00
1878	1.14	0.33	1.39	1.31	1.11	1.29	2.61	1.42	2.12	1.81	1.34	2.53
1879	0.85	0.69	0.57	0.57	0.98	0.85	1.32	2.74	0.74	0.25	1.08	0.77
1880	0.58	1.35	0 87	0.46	1.14	0.59	0.64	1.97	1.36	0.73	0.84	0.46
1881	0.70	0.69	1.44	0.37	0.91	0.78	0.53	0.37	0.38	3.10	0.94	1.24
1882	1.11	0.64	0 39	0.92	1.69	0.88	0.43	0 52	1849	0.39	0.71	0.82
1883	0.32	1.17	0 21	0.73	1.57	1.59	0.87	1.01	0.54	1.15	0.91	.....
Mean	0.75	0.82	0.85	0.72	0.96	0.98	1.18	1.22	1.24	1.22	1.07	0.91

TABLE No. 8.

YIELD OF SUDBURY RIVER, MASS.

TABLE *showing Yield, Rainfall, and the Proportion of the Rainfall Represented by the Yield.*

1875.

MONTH.	Total yield of Sudbury river. Gallons.	Average daily yield. Gallons.	Rainfall. Inches.	Am't of rainfall represented by flow in river. Inches.	Am't of rainfall represented by flow in river. Percent'ge of total rainfall.
January	248,000,000	8,000,000	2.42	0.184	7.60
February	3,257,800,000	116,350,000	3.15	2.411	76.54
March	3,867,200,000	124,748,400	3 74	2.862	76.52
April	7,113,200,000	237,106,700	3.23	5.263	162.94
May	2,863,100,000	92,358,100	3.56	2.119	59.52
June	2,029,100,000	67,636,700	6.24	1.501	24.05
July	774,700,000	24,990,300	3.57	0.573	16.05
August	954,000,000	30,774,200	5.53	0 706	12.77
September	483,800,000	16,126,700	3.43	0.358	10.44
October	1,557,500,000	50,241,900	4.85	1.152	23.75
November	3,038,000,000	101,266,700	4.83	2.248	46.54
December	1,407,300,000	45,396,800	0.94	1.041	110.74
	27,593,700,000	75,599,200	45.49	20.418	44.88

1876.

January	1,550,300,000	50,009,700	1.83	1.147	62.68
February	3,084,500,000	106,362,100	4.21	2.282	54.20
March	10,691,100,000	344,874,200	7.43	7.911	106.47
April	7,680,400,000	256,013,300	4.197	5.683	135.41
May	2,744,000,000	88,516,100	2.763	2.031	73.51
June	517,500,000	17,250,000	2.040	0.383	18.77
July	441,100,000	14,229,000	9.134	0.326	3.57
August	976,900,000	31,512,900	1.720	0.723	42.03
September	430,200,000	14,340,000	4.614	0.318	6.89
October	563,000,000	18,161,300	2.241	0.417	18.61
November	2,537,800,000	84,593,300	5.764	1.878	32.58
December	1,093,100,000	35,261,300	3.620	0.809	22.35
	32,309,900,000	88,278,400	49.563	23.908	48.24

TABLE No. 8—(*Continued*).

Yield of Sudbury River, Mass.

Table *showing Yield, Rainfall, and the Proportion of the Rainfall Represented by the Yield.*

1877.

MONTH.	Total yield of Sudbury river. Gallons.	Average daily yield. Gallons.	Rainfall. Inches.	Am't of rainfall represented by flow in river. Inches.	Am't of rainfall represented by flow in river. Percent'ge of total rainfall.
January	1,586,900,000	51,190,300	3.216	1.174	36.50
February	2,066,900,000	73,817,900	0.739	1.529	206.90
March	11,604,100,000	374,325,800	8.357	8.586	102.74
April	5,584,100,000	186,136,700	3.435	4.132	120.29
May	3,354,200,000	108,200,000	3 702	2 482	67.04
June	1,393,000,000	46,433,300	2 425	1.031	42.52
July	486,060,000	15,679,400	2.951	0.360	12.20
August	291,890,000	9,415,800	3.682	0.216	5.87
September	139,000,000	4,633,300	0 323	0.103	31.89
October	1,522,400,000	49,109,700	8.515	1.127	13.24
November	3,307,300,000	110,243,300	5.803	2.447	42.17
December	3,108,900,000	100,287,100	0.870	2.300	264.37
	34,444,750,000	94,369,200	44.018	25.487	57.90

1878.

January	4,362,100,000	140,712,900	5 632	3.228	57.32
February	5,367,900,000	191,710,700	5.973	3.972	66.50
March	8,454,400,000	272,722,600	4.689	6 256	133.42
April	3,793,200,000	126,440,000	5.790	2.807	48.48
May	3,361,600,000	108,438,700	0.956	2.487	260.15
June	1,179,800,000	39,326,700	3 884	0.873	22.48
July	309,500,000	9,983,900	2.971	0.229	7.71
August	1,146,300,000	36,997,400	6 937	0.848	12.22
September	375,100,000	12,503,300	1 291	0.277	21 46
October	1,244,300,000	40,138,700	6.417	0.921	14.35
November	3,949,000,000	131,633,300	7.024	2.922	41.60
December	7,658,800,000	247,058,100	6.367	5.667	89.01
	41,202,000,000	112,882,200	57.931	30.487	52.63

TABLE No. 8—(*Continued*).

YIELD OF SUDBURY RIVER, MASS.

TABLE *showing Yield, Rainfall, and the Proportion of the Rainfall Represented by the Yield.*

1879.

MONTH.	Total yield of Sudbury river. Gallons.	Average daily yield. Gallons.	Rainfall. Inches.	Am't of rainfall represented by flow in river. Inches.	Am't of rainfall represented by flow in river. Percent'ge of total rainfall.
January	1,698,200,000	54,780,600	2.478	1.249	50.40
February	3,747,900,000	133,853,600	3.562	2.756	77.37
March	5,651,400,000	182,303,200	5.140	4.156	80.86
April	7,313,700,000	243,790,000	4.716	5 379	114.06
May	2,701,400,000	87,141,900	1.579	1.987	125.84
June	970,200,000	32,340,000	3.789	0.713	18.82
July	381,700,000	12,312,900	3.933	0 281	7.14
August	958,300,000	30,912,900	6.509	0.705	10.83
September	330,300,000	11,010,000	1.878	0.243	12.94
October	171,500,000	5,532,300	0.809	0.126	15.57
November	482,500,000	16,083,300	2.682	0.355	13.24
December	1,121,800,000	36,187,100	4.344	0.825	18.99
	25,528,900,000	69,942,200	41.419	18.775	45.33

1880.

January	2,716,000,000	87,612,900	3.566	1.998	56.03
February	4,054,400,000	139,806,900	3.980	2.982	74.92

TABLE 9.

Monthly Rainfall and Flow, West Branch, Croton River.

	1867.			1868.			1870.			1871.			1872.		
	Rainfall in inches.	Flow in inches.	Percentage of rain flowing off.	Rainfall in inches.	Flow in inches.	Percentage of rain flowing off.	Rainfall in inches.	Flow in inches	Percentage of rain flowing off.	Rainfall in inches.	Flow in inches.	Percentage of rain flowing off.	Rainfall in inches.	Flow in inches.	Percentage of rain flowing off.
January	....	.....	.....	2.90	2.346	80.886	4.51	6 682	125.980	3.80	0.674	17.747	1.44	2 687	186.597
February	....	.....	.....	1.38	0.853	60.340	6.40	6 617	103.859	3.81	2.248	59.013	1.22		
March	....	.....	.....	2.55	5.331	209.071	3.80	3.912	102.955	4.27	6.744	157.946	2.59	(c)6.042	125.622
April	....	.....	.....	3.87	3.868	99.953	5.45	8.630	1 58.354	3.01	2.806	93.212	1 00		
May	6 86	5.031	73.345	8.79	7.342	83.524	2.30	2.306	100 265	3 45	3.406	98.722	(d) 2.04	(c)2.690	131 867
June	5.28	3.756	71.128	4 53	2 317	51.141	2 06	0.842	40 864	5.73	1.007	17.576	3.69	1.725	46.748
July	5.25	1.649	31.410	(a) 1.90	0.316	29.000	3.43	0.463	13.498	5.07	0.370	7.301	4.00	1.758	43 450
August	10.04	5.403	53.819		1869.		5.10	0.174	3.412	5.24	0.805	15.365	4 34	0 594	13 687
September	3.62	1.443	39 850	(b) 1.86	0.097	5.193	2.85	0.095	3.344	1.44	0.569	39.521	5.99	1.546	25.809
October	3.66	1.093	29.869	9 46	5 328	56.324	4.73	0.531	11.233	6.18	1.761	28.490	3.69	8.875	23.713
November	3.10	1.757	56.668	2.43	2.667	109.753	2.51	1.017	40.506	4.35	3.370	77.467	2.15	0.554	25 767
December	2.62	3.690	140.800	5.96	5.740	96.304	1.49	0.973	65.617	2.58	2.201	85.322	(e) 0.10	0.110	110.181
													.....	.....	.....

(*a*) Part of month July 1st to 13th.
(*b*) Part of month September 26th to 30th.
(*c*) Flow estimated.
(*d*) Part of month April 9th to 30th.
(*e*) Part of month November 1st to 6th.
In 49½ months total rainfall 206.25 inches, flow 129.764, percentage flowing off 62.916.

TABLE No. 10.

TABLE *showing Estimated Spring Flow from Oak Orchard Swamp Water-Shed, with Dimensions and Probable Cost of Channel capable of Discharging this Amount of Water.*

NUMBER OF DISTRICT.	Acres of water-shed.	Lengths of canal division. Feet.	Total fall, in feet.	From separate districts. Cubic ft. per second from water-shed.	Carrying capacity of canal, in cubic feet, per second.	Area of canal. Cross section.	Depth of canal.	Breadth at top.	Breadth at bottom.	Length of division.	Cross sections at ends of divisions.	Cubic yards of excavation. Gross.	Approximate cubic yards already excavated.	Cubic yards to be excavated.	Cost per cubic yard.	Estimated expense of excavation.
						Sqr. ft.	Feet.	Feet.	Feet.	Yards.	Sq. yds.					
1	20,776	21,582	4.6	145.4	145 4	68.65	6	24	0.00	7,194	7 63	54,890	0.000	54,890	$0 25	$13,722 50
2	13,220	15,510	6 5	92.6	238 0	76.91	6	24.82	0.82	5,170	8.55	41,825	16,730	25,095	25	6,273 75
3	19,960	14,388	2.8	139.7	377.7	152 10	6	37.35	13.35	4,796	16.90	61,005	24,402	36,603	25	9,150 75
4	10,152	11,088	2.5	71.1	448.8	164.19	6	39.36	15.36	3,696	18.24	64,938	25,975	38,963	25	9.740 75
5	11,416	21,582	6.7	79.9	528 7	164.08	6	39.34	15.34	7,194	18.23	131,180	52,472	78,708	25	19,677 00
6	10,218	9,966	1.8	71.7	600 4	226.60	6	49.76	25.76	3,322	25.18	72,087	28,835	43,252	25	10,813 00
7	0.000	3,636	1.1	0.0	600.4	184.60	5	46.92	26.92	1,232	20.51	28,110	16,884	11,256	25	2,814 00
8	657	4,620	1.4	4.6	605 0	171 55	4	45.20	40.58	1,540	19.06	30,477	22,858	*7,619	1 50	11,428 50
9	2,143	5,280	2 7	15.0	620.0	141.34	3½	42.40	38.36	1,760	15.70	30,539	26,077	*4,512	1 50	6,768 00
	88,572	107,712	.....	.....	.....	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	$90,388 25
																†22,597 06
Total cost..	.....	.....	.....	.....	.....	.....	....	.....	.....	.....	.....	.....	.....	.....	.....	$112,985 31

* Rock. † Equal to 25 per cent, for contingencies.

REPORT ON THE DRAINAGE

OF THE

VILLAGE OF PEEKSKILL.

REPORT.

ALBANY, *January* 8, 1884.

To the Board of Health of Peekskill, EUGENE B. TRAVIS, Esq., *Secretary :*

GENTLEMEN — On November 21st ult., during the regular quarterly meeting of the State Board of Health, a telegram was received from you requesting, on behalf of the village board of health, a plan of sewerage for the village of Peekskill from the State Board of Health, and placing such request entirely upon sanitary grounds.

The Board considered your request, and understanding that the purpose of your action in thus asking assistance of the State Board of Health was, that you might secure for your village a system of sewers that should answer not only engineering requirements, but also meet those most important sanitary requirements essential to the health of the people, and in which the sewers of many towns have so lamentably failed, the Board voted

"That the telegram and request be referred to the committee on drainage, sewerage and topography, with discretionary power to advise and aid the local sanitary authorities of Peekskill in their effort to secure a sanitary system of sewerage."

In accordance with this authority and direction, Mr. James T. Gardiner, the chairman of the committee on drainage, sewerage and topography, visited Peekskill November 30th, and met your board on the evening of that day.

The next morning, in company with Mr. Travis, and Mr. Hart of your board, Mr. Gardiner made an examination of the village with reference to the proper method of sewering its streets. The facts ascertained in this examination, together with the maps and street grades, which you furnished the State Board, have been carefully considered, and we are now ready to state briefly to you our conclusions, and the reasons therefor.

REPORT.

We find your village peculiarly adapted to a thorough system of drainage and sewerage. Lying, as it does, on the steep side-slopes of the valley of McGregory's brook, which descends rapidly to the Hudson, your question of sewerage is in no way complicated with that of the disposal of storm water. In the channel of the brook nature has provided for the rapid discharge of all the storm water of the village into the Hudson. At present, this brook channel running through the center of your town, is being used as an open sewer. In times of low water the filth discharged into this brook, lodging, as it must, along the borders of the channel becomes offensive to the senses, and furnishes those dangerous conditions which are liable at any time to prove one of the most essential factors in the outbreak of severe epidemics.

The public health of Peekskill is undoubtedly endangered by allowing the sewage of the village to pass into this brook, which runs through the most populous part of the town; but the use of the brook for carrying off storm water, which is rapidly discharged into it from the streets, can in no way injure the health of your people, but must rather tend to keep the channel of the brook in a wholesome condition.

You are, therefore, specially favored by nature in having most perfect means for discharging all the water that falls on the surface of the village, and, in our judgment, no artificial means are needed to secure surface drainage, except in one or two small spots, where, probably, the desired result can be better accomplished by underdraining the soil.

In the draining and sewerage of a town, there are three things to be considered and provided for — surface drainage, sub-soil drainage and sewerage. The first includes the disposal of the storm water that falls upon and runs off from the surface and roofs of the houses of the village; the second, the disposal of the sub-soil water that occasions wet cellars; and the third, the disposal of the sewage proper of the village, the latter consisting of the waste water from the houses, the sewage from the water-closets and privies, and any offensive wastes from factories or shops.

If in any town large sewers are built to carry off all of these three classes of waste fluid matter, such constructions are very costly. The storm water, liable to be discharged from any given area with steep, rocky slopes, is not infrequently fifty times as great in amount as the sewage proper from such a district. If, therefore, sewers are to be made to carry off storm water, they must be many times as large as would be required to carry off sewage alone.

To build such sewers is a very costly undertaking, and the results are generally very imperfect from a sanitary point of view.

In ordinary times the sewage fills but a very small portion of these large combined sewers. When, however, heavy rainfall occurs, the walls of these sewers, if of brick, are bathed and saturated with dilute sewage. On the recession of the storm water these brick sides of the sewers furnish those conditions which are extremely favorable to the growth of those low organisms or *bacteria*, which are believed to produce many serious diseases.

The investigations of Koch and others, during the past ten years, have thrown great light upon the causes of many of the diseases connected with filth, rendering it probable that they are due to microscopic organisms. These diseases are popularly known as the germ diseases. A number of the most serious ills which afflict mankind are now supposed to have their origin in connection with these microscopic organisms which, under favorable circumstances, rapidly multiply and destroy animal vitality.

The conditions prevailing in large sewers are known to be favorable to the growth of lower organisms. Moisture, heat, the presence of ammonia and darkness, are all important elements in producing these little deadly organisms, of whose habits much now is known through the process of artificial propagation.

Until these discoveries, concerning the probable origin of diseases, which have all been made within the past few years, it was supposed that large sewers could be made to answer sanitary purposes.

When large sewers were first introduced into the towns that had no sewer systems there was a marked improvement in the public health; but as the so-called "modern conveniences" began to be introduced into the interior of dwellings, so that the air from the sewers could escape into the houses through defective plumbing and otherwise, physicians observed a class of diseases which they ascribed to sewer gases, supposing that it was some gas generated by fermentation in the sewer which was the cause of disease.

Basing their action on this assumption, that a gas was the cause of sewer diseases, engineers, until within a very short time, have supposed that if they could make sewers which would carry off sewage without fermentation, and could so ventilate sewers as to carry off any gas that might be formed, they would no longer be unwholesome.

The results of modern sanitary investigation as to the cause and favoring conditions of these sewer diseases show, that while the escape of gases from sewers into human dwellings may lower the tone and resisting power of the human system, the gases themselves are not, probably, the cause of specific disease.

The air from a sewer where no gas is formed, but where the germs of enteric or typhoid fever are planted, may be more fatal to the human system than some of the worst smelling gases that originate in the fermentation of sewage.

It is for this reason that the sanitarians who are thoroughly conversant with the recent discoveries in the origin of diseases feel grave doubt as to whether large sewers can be made safe from a sanitary point of view.

It is the judgment of the State Board of Health that large brick sewers, planned to carry storm water and sewage, should never be used when they can possibly be avoided. In the village of Peekskill they are entirely unnecessary. The storm water from your roofs and streets and yards is at present flowing rapidly off into the brook which runs through the village and thence into the Hudson, without occasioning any inconvenience. You may safely continue to let nature dispose of the storm water in the natural way, letting it flow off into the brook and into the river.

Within the past three years you have, however, introduced a supply of water to the village; many citizens have now water-closets, and all are using greatly increased quantities of water in their dwellings. This waste water from the houses is either being discharged into cesspools, or, in certain cases, by short drains from those dwellings in the central part of the town, it is discharged into the creek. Either of these modes of disposal, by cesspool or by draining into the creek, is liable to seriously injure the health of your village.

The slopes on which Peekskill is built are of solid rock, covered with a thin coating of porous gravelly earth. Water thrown into cesspools, leaches rapidly through the soil and runs down along the surface of the rock, entering often the cellars of houses on streets below. The filth from cesspools on the higher streets may, in frequent instances, reach the ground around dwellings situated below them, and may enter the cellars and contaminate the air of the whole house. The use of cesspools is, therefore, specially dangerous in a village situated as yours is.

Before the citizens of Peekskill had ample water supply the evils from soakage of filthy water through the soil were very much less felt than they will be in the future. As the abundant use of water becomes more common in the houses, the danger of disease from soil pollution will become greatly aggravated.

We have already spoken of the evils which arise from draining into the open brook bed, running through the thickly populated part of your town. Your citizens are already so familiar with this evil that it is not necessary for us to dwell upon it.

Therefore there is no way for you to dispose of the sewage of your village in a healthful manner, except to build proper sewers for carrying it off to the river. Both for the sanitary reasons heretofore mentioned, and for the sake of economy, we recommend that these sewers be constructed to carry sewage only, and that no storm water be admitted to them.

In such a system the collecting sewers should be made of the best glazed pipe, and need not be over six inches in diameter. At the dead end of each branch of the sewer there should be an automatic flushing tank, discharging at least once in every 24 hours, and containing, perhaps, 140 gallons of water. As these small pipes run together the diameters of the sewers must be increased in proportion to the amount of water to be carried.

It will be necessary to carry outfall sewers down the principal streets on both sides of the brook as far as the flat ground along the river where they may be united for common discharge near the mouth of the creek. This outlet of the sewer into the river should be carried so far out as to have its mouth always below low-water line.

The pressure of the water flowing down from the hills will cause a constant discharge from the pipes, even when they are below low water. The system which we here recommend to you is the separate system of sewerage, as it has been applied in this country in Memphis, Tenn., Norfolk, Va., Keene, N. H., Kalamazoo, Mich., West New Brighton, N. Y., and other places.

The objections originally made to these small sewers, that they are liable to constant stoppage, have not proved to be well founded. They are a practical success in all these places. In Memphis they have now been in operation over three years.

From a sanitary point of view these small sewers made of glazed pipe, running from one-half to three-quarters full of sewage, constantly and thoroughly flushed by the discharge of flushing tanks, have proved very greatly superior to large sewers.

In point of economy the separate system has greatly the advantage. The cost is always less than half of that of the large combined sewers, and is sometimes but one-third to a quarter the cost.

In order that these sewers shall work properly they require many openings into the air. In Memphis these are secured by carrying every house-sewer through from the street sewer to the house without trapping, and there making connection with the open air through the soil-pipe, which is carried above the roof of the full size of the pipe, and left completely open at the end.

In our judgment this is not the safest arrangement. We advise that a trap be placed in the house sewer, just outside of the house. From the street side of this trap a pipe should rise to the roof of the

house, which would supply air to the sewer from the trap outward, and also supply air to the main sewer itself, thus securing a complete circulation of air through the branch sewer leading from the house, and through the street sewer. On the house side of the trap before spoken of, another pipe should rise to the roof of the house, supplying air for the house part of the drain alone. This is technically known as a foot vent to the house drain. The soil-pipe should then be carried directly up to the roof, and above it, the full size of the pipe. The house drain has thus two openings to the fresh air, and a complete circuit of air is secured through the drain inside of the house, while the pipe coming from the street side of the trap ventilates the street sewer and the house branch.

In recent sanitary practice it has been found that nothing so thoroughly conduces to the purification of drains as the discharge through them of a strong current of fresh air. The expenditure necessary to secure this is, in our judgment, amply repaid by the security gained. In many places it has been the custom to make the foot-vent of the house drain, which opens into the house drain on the house side of the trap, a short pipe merely rising to the surface and turning over with a crook, to prevent any thing being thrown down the pipe. The result of our investigations is to show that there is often an outward current from the foot-vent of the house drain, and that, therefore, the air of the drain is liable to be discharged under the windows of the house, unless this foot-vent is carried up to the roof.

This outward flow of air from the foot-vent is found to occur whenever a bath-tub or closet is discharged in the house. But this is a mere puff of air, driven out of the foot-vent for a few seconds by the movement of the water through the drain.

During the summer, when the air in the house is often much cooler than the external air, a reversion of the current in the drain is likely to occur, and a more or less continuous outflow of drain air takes place at the foot-vent.

In the accompanying diagram is shown the method of ventilating the house drains and sewer of which we approve, and the construction of a *short* foot-vent of which we disapprove.

We refer to this question of house drains because with separate sewers it is necessary that the house drainage should be planned to accord with the sewers, or the sewers will not work properly.

SUBSOIL DRAINAGE.

Where the separate system of sewers has been built by the Drainage Construction Company of Boston they have laid in the same

trench with the sewer pipes a line of agricultural drain tile to underdrain the soil of the street.

We recommend that a line of drain tile should be laid on both sides of the sewer pipe and that drain tile be laid in the trench with the branch sewers that run up to the houses. When trenches are opened for laying the branch sewers the laying of an additional line of porous drain tile is a very small added cost, but the result is to secure the complete underdrainage of the soil about the house.

We consider that in the case of Peekskill, as of almost all other places the laying of a system of sub-soil drains with the sewers is a very great advantage to the health of the place; while the cost is very small.

It is not necessary for us in this report to enter into all the details of the plan for a system of separate sewers to carry off the sewage of Peekskill; the map furnished us shows that about 65,000 feet of sewer will be needed to completely provide for the wants of the town. The only uncertainty as to the cost of such sewers arises from the difficulty of determining beforehand how much rock excavation will be required in the trenches of these sewers, but from the best data which can be had, derived from the experience of laying water and gas-pipes through the town, it is probable that the total cost of the sewers and sub soil drains for the village would not exceed $85,000, and it might be done for much less if the amount of rock to be excavated proves small.

The cost of sewering and draining the city of Keene, where 61,200 feet of sewer was required, was $74,000. This work was done by the Drainage Construction Company before mentioned.

It appears, therefore, that the work at Peekskill should certainly be accomplished for the sum mentioned.

The success of the separate system depends largely upon the precision with which the work is executed and the quality of the materials used, both as to pipe and cement. Where these works have been imperfectly done, or poor material has been used, the results are not satisfactory.

A great deal of discussion has taken place as to the number of manholes which should be built. It is our judgment that if properly constructed, as they have been built at Keene, a large number of manholes will be of decided assistance in examining the working of the sewers and in keeping them free from obstructions; while if constructed and covered, as done by the Drainage Construction Company in the sewerage of Keene, they are perfectly safe from a sanitary point of view.

There are many details of improvements which this company have developed from the result of their experience applied in the sewering of Keene, N. H., which should be used in the sewers of Peekskill, but these are matters of minor detail of construction which cannot be con-

sidered without the aid of drawings, and it is not necessary to discuss them at present.

It is advisable for sanitary reasons that the sub-soil drains should not have their outlet into sewers.

In conclusion, therefore, we earnestly advise that the village of Peekskill take immediate measures to secure a thorough system of separate sewers, to carry off the sewage alone, and a system of sub-soil drains, laid in the same trenches with the sewers, to remove all soil moisture from about the houses, and we strongly advise, both for sanitary and economical reasons, that large combined sewers, to carry off sewage and storm water together, should not be constructed.

JAMES T. GARDINER,
Chairman.
EDWARD M. MOORE,
President.
ERASTUS BROOKS,
ELISHA HARRIS,
Secretary.

Resolution of the State Board of Health. At a special meeting of the Board, held in Albany, February 22, the above report was presented and adopted by the Board, and on motion was ordered printed.

FREDERICK CARMAN,
Acting Secretary.

PREVALENT DISEASES IN THE STATE.

REPORT

ON

OUTBREAK OF DIPHTHERIA AT BATAVIA BLIND ASYLUM.

ROCHESTER, *October* 24, 1883.

Dr. E. HARRIS, *Secretary State Board of Health :*

DEAR SIR — In pursuance of your directions received by telegraph, Monday night, October 22, I went to Batavia and examined the sanitary condition of the State Asylum for the Blind, as well as the origin, extent and cause of the outbreak of diphtheria at the asylum. I found first that the boy with whom the disease started was a weakly boy subject to epileptiform convulsions, that the next boy sick had been with him considerably while he was sick, and had subsequently played with the two others that are now down with the disease.

The history of the outbreak is as follows: Tuesday the boy Parsons, age nine, sickly, had a convulsion of some severity, followed by a number of others, lasting until the evening of the following day, Wednesday; Thursday he complained of sore throat and on examination it was found that he was suffering from facial and laryngeal diphtheria. Friday a boy Whitmarsh, age seventeen, frail though not sickly, and who had been with Parsons a great part of the time from Tuesday and was with him while he had a sore throat Thursday, until the character of the disease was known, had the initial chill, followed with pain and exudate in throat. The same day Arnholdt, age fourteen, who had played with Whitmarsh, also showed symptoms of diphtheria. The following day Cooley, age sixteen, small undersized boy, also complained of being sick, and upon examination showed diphtheritic in fauces. Upon this day the school was disbanded, the pupils being sent home after first being carefully examined and instructed to communicate with the superintendent in regard to their subsequent health.

The superintendent had received cards from most of them on Tuesday, stating that up to that time they had all remained well. As for the sanitary condition of the building it was in a bad state, although the superintendent had done all in his power to keep in good con-

dition the most unsanitary method of plumbing and sewerage that was possible. The subjoined rough sketch will probably explain itself. The plumbing in main building of which there is little, except in kitchen — is fifteen years old and unprotected by traps as far as I could ascertain by my own observations and the testimony of the engineer and superintendent. It discharges the waste into a large eighteen-inch egg-shaped tile drain, which runs close by the well, which is very deep and from which the water for drinking and other purposes is drawn. The two annexes at the sides and end of the main building are seven or eight years old and in these are placed the water-closets, urinals, bath-tubs and standing bowls; all of the cheapest kind and trapped by the simple siphon or running trap. The water-closets are of the pan and hopper variety. The waste from these annexes is discharged into a fifteen-inch egg-shaped tile drain, that with the one from the main building empties at a distance of twenty rods into a thirty-inch egg-shaped tile, thirty rods long. This passes under the play ground to a cess-pool partially closed, which retains the solid matters and permits the fluid to escape by an open ditch ten rods long, to a swamp 100 acres in extent. The building is on a hill and the sewer has a fall of about fifteen to twenty feet to the swamp. The water, which I have not examined as yet, but which I learned has been done so roughly by the doctor in charge of the asylum, is by his report badly contaminated with sewerage.

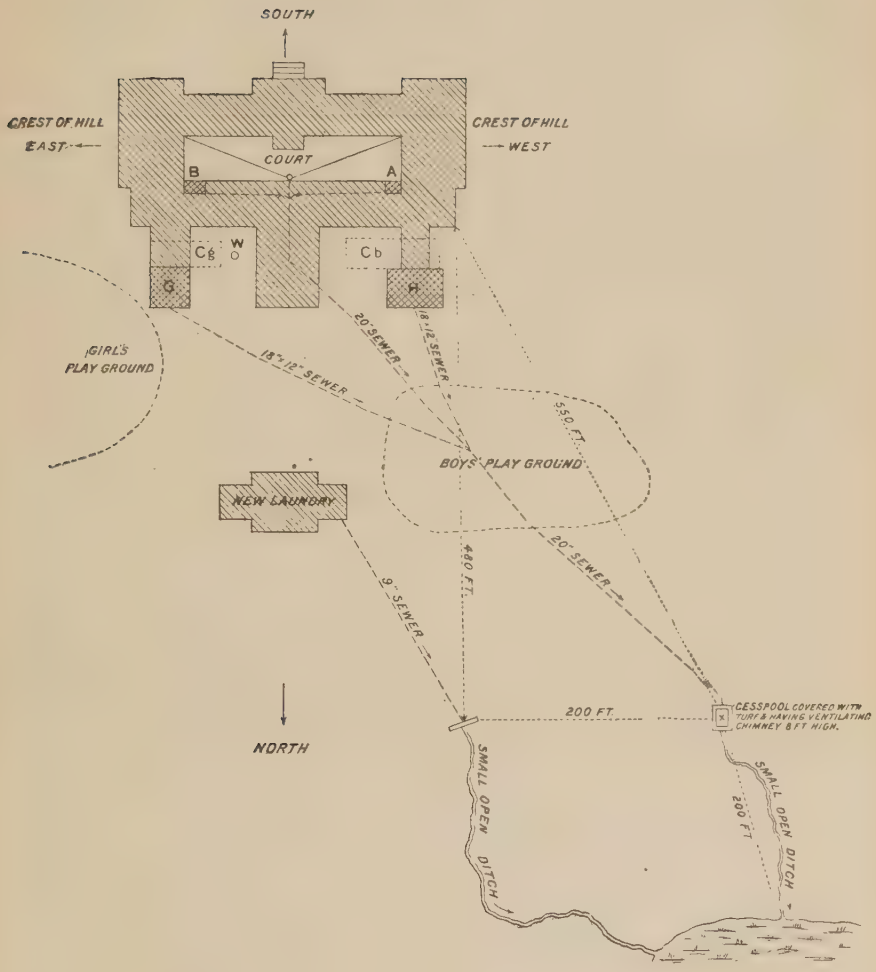
In regard to the method by which the contagion entered the building I was unable to trace it to any other source than the bath-room at the corner of the corridor, off of which the boy Parsons slept and in which he played. This bath-tub was untrapped, and belonged to the system of the main building. The door of the room was kept open as was also the door from the west corridor to the connecting hall, leading to the water-closets and bath-room in the annex, the doors of which rooms were also left open. This boy slept in a room with four other boys, but on account of his ill health the window was kept closed, there being but one in the room. His bed was, as seen in this rough draft, close against the opening of the ventilating shaft, which has its origin from an empty room on first floor, Parsons being on the second. The other boys who were taken sick slept on the third floor, two on the west corridor and one in the main part of the building.

The sanitary history of the building has been but fair, they having had a case or two of scarlet fever every few years. Outside of the plumbing and sewerage the building is clean — in a good condition, although I think the number of boys that sleep in the rooms are too many for the size of the rooms; four children sleeping in a room 18x14x13 feet. There was every possible effort made to connect the disease with some origin external to the establishment, but without success. There was no case of diphtheria in Batavia and vicinity, nor had there been for some time. The boy had been in the school between four and five weeks and there had been none of the disease in his town when he left or, as far as was ascertained, since.

Yours, respectfully,

RICHARD M. MOORE,

Sanitary Investigator, West District.


SOUTH
CREST OF HILL
EAST
CREST OF HILL
WEST
COURT
B
A
Cg
W
Cb
G
F
GIRL'S
PLAY GROUND
18"-12" SEWER
20" SEWER
13"-12" SEWER
550 FT.
BOYS' PLAY GROUND
NEW LAUNDRY
400 FT.
20" SEWER
9" SEWER
NORTH
200 FT.
CESSPOOL COVERED WITH
TURF & HAVING VENTILATING
CHIMNEY 8 FT HIGH.
SMALL OPEN DITCH
200 FT
SMALL OPEN DITCH

Rochester, N. Y., *November* 12, 1883.

Dr. Elisha Harris, Esq., *Secretary of State Board of Health:*

Dear Sir — In pursuance of recent instructions from your board to make an inspection of the sanitary appliances and the drainage system appertaining to the asylum for the blind at Batavia, N. Y., the undersigned begs leave to state, that he made said examination in company with Dr. Richard M. Moore, of this city, on October 30, 1883, and would now respectfully submit the following

Report.

The asylum for the blind at Batavia, N. Y., is a large structure, built of brick, and in a quadrangular form, with an inclosed court. From the northern side of the main building three wings or additions project, and in the eastern and western wings are located the various sanitary appliances, such as water-closets, urinals, slop-sinks, bath-tubs and washing trays, for the use of the male and female inmates. The general plan of the buildings and its drainage system is shown on Plate I, hereunto appended.

The asylum is located upon the crest of a high ridge, with an extensive lawn in front and farming land in the rear. About 750 feet north-westerly from the building a marshy swale, having an area of from eighty to one hundred acres, extends for a considerable distance in a northerly and easterly direction, and into this marsh the sewage from the institution is now being discharged as it overflows from a large cess-pool, as indicated upon Plate I.

The water supply of the asylum is derived from a large well, which is said to have been sunk to a depth of fifty-six feet through boulder clay to the original rock; and the water thus obtained is further supplemented by the rain-water which falls upon the roofs of the buildings and is conducted into two large subterranean cisterns or tanks of masonry, where it is stored. From these tanks, and when necessary also from the well, the water supply is pumped by steam power up into three large cisterns in the attic of the main building, whence it is distributed by pipes to the places where it is to be used. The capacity of these three cisterns is respectively 175, 90 and 90 barrels, thus providing a storage of 355 barrels, or about 10,650 gallons. During the school term of forty weeks in each year, it is reported that said tanks in the attic are regularly filled three times per week and that the average amount of water used in the whole institution is at the rate of about 700 barrels or 21,000 gallons per week. There are about 170 inmates usually in the asylum, so that the amount of water used for all purposes is about eighteen gallons per head per day, which is very small as compared with the quantity required in cities provided with water-works.

Previous to the construction of the wings or annexes already mentioned the plumbing fixtures were located in the basement of the main building, but after the annexes were built, all water-closets, baths, etc., were removed and erected in the latter. The space thus gained in the main building was thereupon converted into a laundry, and all openings into the sewer pipe underneath the cemented floor *are said* to have been carefully plugged. This important fact, however, together

with a knowledge of the condition of the sewer pipe itself, can be determined only by a direct examination, which I have advised the trustees to cause to be made. Into this sewer, which is reported to be of egg-shaped cement tile, fifteen inches by twenty inches, a number of apparently trapped floor-sinks are still connected, and hence the necessity for a thorough investigation as to its condition.

At a point about 150 feet from north-western corner of the main building, two other lines of large egg-shaped cement tile, twelve inches by eighteen inches, unite with the main line just described, and these seem to carry off the sewage from the two annexes. All of these sewers are said to be laid at a depth of about seven feet below the surface of the ground. The overflow pipes of the two subterranean rain-water tanks are connected with the sewers from the two annexes, but whether *with or without traps*, could not then be determined. This matter should also receive particular attention, together with the proper ventilation and cleaning of said tanks.

The sanitary appliances in the two annexes were set up about eight or nine years ago, and without the introduction of vent-pipes or the extension of soil pipe upwards through the roof. The general arrangement of these fixtures, as they were at the time of my inspection, is shown on Plates II, III, and IV, and without further comment. It is needless to say that they were all pronounced unsafe, and that the plumbing work should be entirely remodeled before the inmates returned to the asylum. Holes in the leaden traps, cracks in the soil pipe, leaky joints and numerous other defects were found in abundance. The improvements that I have recommended to be made at once are also shown on Plates II, III and IV.

In planning these improvements, my aim has been to utilize as much as possible of the existing materials and fixtures, so as to make the expense a minimum compatible with safety. The pan water-closets I have advised to remove entirely, and to substitute therefor one of the newest type of closets, known as the "wash-out," with overhead cistern water supply. Of the different styles of such closets now in the market I have recommended the one named the *purita*, manufactured by the J. L. Mott Iron Works, of New York. Its simplicity of construction and mode of ventilation commend it particularly in places where skilled attention cannot be secured. I have advised that these closets be set without any casing of wood-work except the seat, which latter is to be so arranged as to cause a powerful flush from the cistern as soon as it is released, thereby preventing neglect on the part of those who have occasion to use the closet. The exposure of the fixture to sight will also have a tendency to insure general cleanliness of the apartment, as well as the discovery of accidental defects, etc. All traps and soil and vent pipes are to be left in plain view in the rooms and are to be painted with whitelead, so that any leakage may be detected by the discoloration. The soil pipes are to be of cast-iron, thoroughly coated inside and outside with the usual coal tar varnish. For the smaller waste pipes, lead is to be used. Vent pipes to be of the same diameter generally as the waste pipes to which they are connected, and to be of lead, or wrought-iron steam-tubing or cast-iron, according to circumstances of location and relative economy. Pipes for ventilation purposes exclusively, and which are not in com-

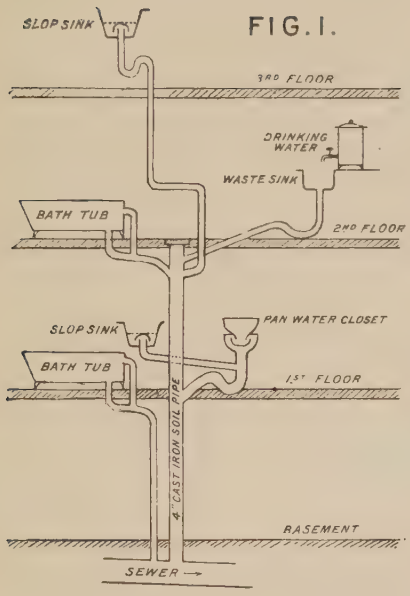


FIG. 1.

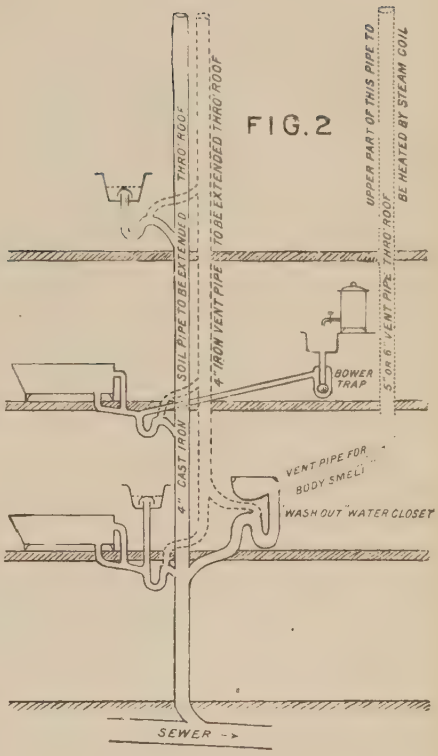

4" CAST IRON SOIL PIPE TO BE EXTENDED THRO' ROOF
4" IRON VENT PIPE TO BE EXTENDED THRO' ROOF
UPPER PART OF THIS PIPE TO BE HEATED BY STEAM COIL
5" OR 6" VENT PIPE THRO' ROOF
BOWER TRAP
VENT PIPE FOR BODY SMELL
WASH OUT WATER CLOSET
SEWER

FIG. 2

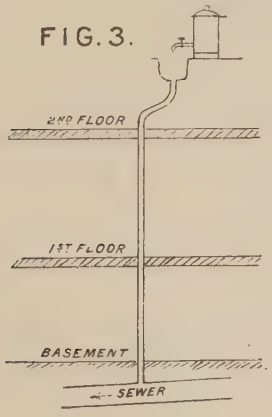


FIG. 3.

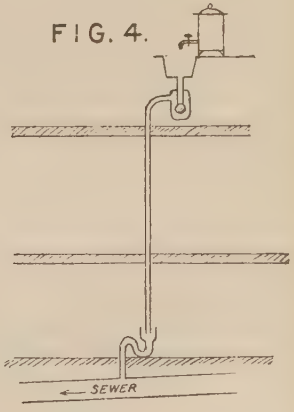


FIG. 4.

FIG. 4.

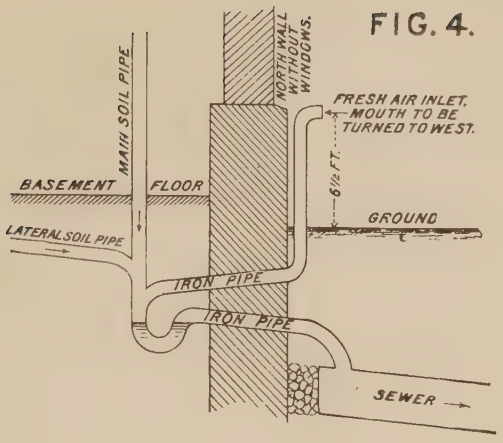
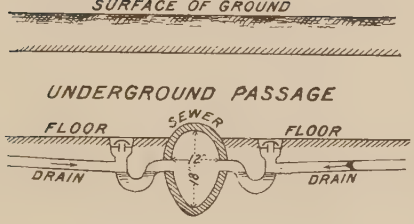
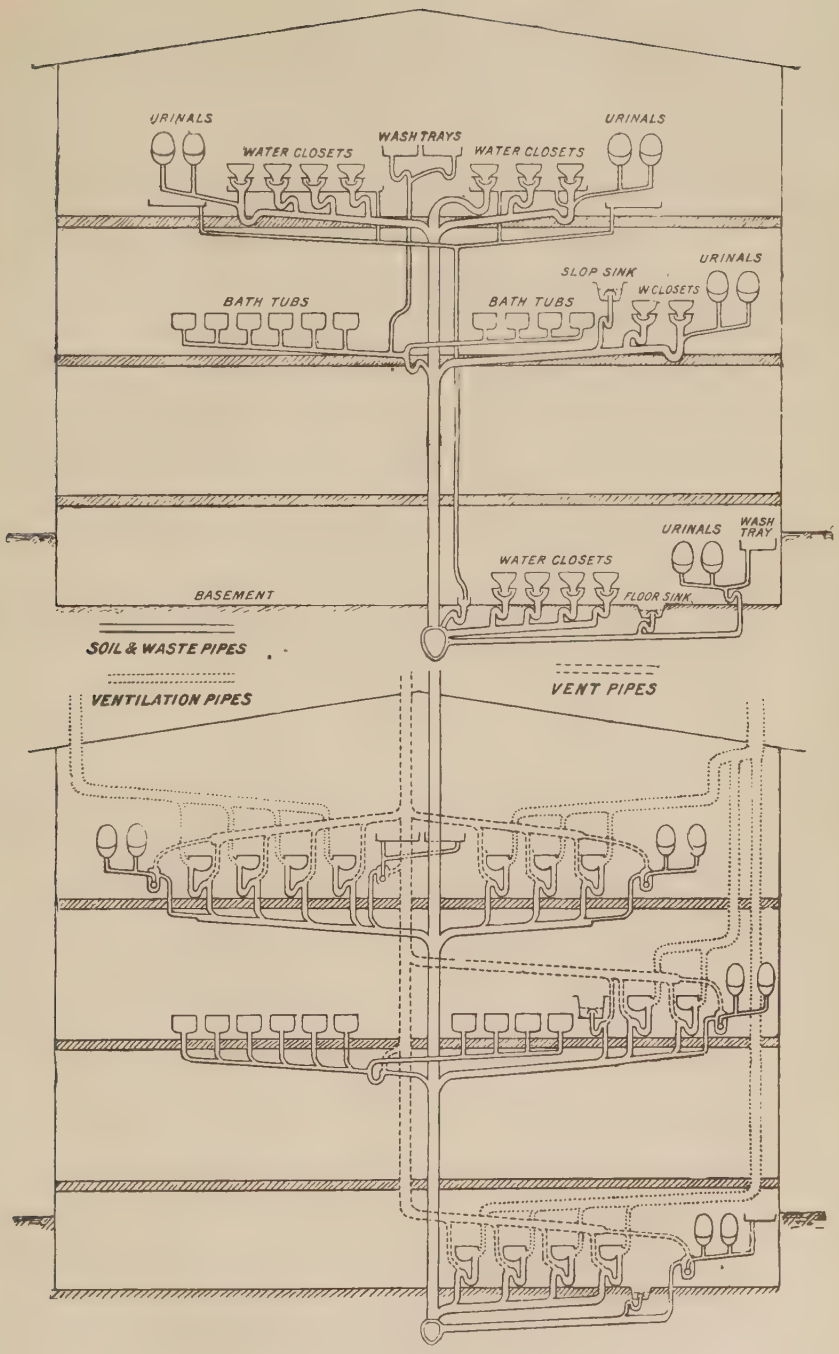

MAIN SOIL PIPE
NORTH WALL WITHOUT WINDOWS.
FRESH AIR INLET. MOUTH TO BE TURNED TO WEST.
6½ FT.
BASEMENT
FLOOR
GROUND
LATERAL SOIL PIPE
IRON PIPE
IRON PIPE
SEWER

FIG. 3.


SURFACE OF GROUND
UNDERGROUND PASSAGE
FLOOR
SEWER
FLOOR
12"
18"
DRAIN
DRAIN

SOIL & WAS


URINALS
WATER CLOSETS
WASH TRAYS
WATER CLOSETS
URINALS
SLOP SINK
URINALS
BATH TUBS
BATH TUBS
W CLOSETS
URINALS
WASH TRAY
WATER CLOSETS
BASEMENT
FLOOR SINK
SOIL & WASTE PIPES
VENTILATION PIPES
VENT PIPES

munication with the system of soil pipes, may be of heavy tin or galvanized sheet-iron, since slight leakage will here be of little consequence. The upper portion of these pipes for ventilation purposes only is to be warmed by a surrounding coil of steam pipe. Every soil pipe and its corresponding vent pipe is to pass upwards through the roof and the end to be left open without hood or cowl. Where several soil and vent pipes are in the same apartment on the upper floor, they may be united separately into a single large soil pipe, or single large vent pipe, in the attic, and thence pass through the roof. Thus, two or three four-inch soil pipes may be united in the attic into one six-inch or eight-inch pipe passing through the roof, and two four-inch vent pipes may similarly be united into one six-inch pipe; but the union of a *soil pipe with a vent pipe at any point* is not hereby recommended. *Each system* should pass through the roof separately, and care should be taken to remove the ends of the ventilation pipes proper as far as practicable from the ends of the soil and vent pipes, so that any failure on the part of the ventilation pipes to perform their function will not result in the admission of any air from the soil and vent pipes.

Owing to the lateness of the season, little can now be done about changing the mode of disposing of the sewage, or of providing traps to the large sewers and special fresh air inlets. This part of the general sanitary improvement of the asylum can perhaps be safely postponed until spring, and an opportunity will then be given to the trustees to thoroughly discuss the subject of sewage disposal. It may also be remarked that the village of Batavia is contemplating the construction of a system of sewers, and should this intention be carried into effect, the problem of how to dispose of the organic wastes from the asylum buildings will then receive an easy solution. I have advised the trustees to adopt the *sub-surface irrigation* system of disposal; but the expense thereof, in conjunction with the cost of the immediate improvements of the plumbing fixtures, causes them to prefer to delay action regarding the disposal of the sewage until spring.

It affords me great pleasure to bear witness to the solicitude of the trustees that the building shall at once be put in the best and safest condition, and to announce that an experienced contractor from this city has already received instructions to begin the work of renovating all of the sanitary appliances. In a conference with him this afternoon, I learned that considerable work has already been performed and that he expects to finish his task in about ten days.

Respectfully submitted,

EMIL KUICHLING,

Civil and Sanitary Engineer.

ROCHESTER, N. Y., *November* 19, 1883.

Dr. ELISHA HARRIS, Esq., *Secretary of State Board of Health:*

DEAR SIR — On Saturday, the 17th inst., the undersigned made a second inspection of the sewers and drains connected with the Institute for the Blind at Batavia, N. Y., and would now respectfully sub-

mit to you a report of the condition of said sewers, together with such additional directions for the sanitary improvement of the buildings as then suggested themselves.

The sewers leading from the three rear wings or annexes were exposed by excavations at the points G, D, F, where they left the building, and also at the point K, near their junctions with the main sewer leading to the cess-pool. All of them were found to be of cement tile, the newer ones GK and FK, being 12x18 inch egg-shaped, and in good order generally, while the older line DK, was found to be originally twelve inches in diameter, but is now broken at the quarters, as represented in Fig. 2, wherever it was exposed.

These sewers are from seven to eight feet below the surface of the ground, and as the latter was already somewhat frozen, it was not deemed prudent to do more than to request that the broken section exposed at D shall be replaced by an equal length of eight-inch vitrified tile, and that a running trap of eight-inch vitrified tile be inserted in said line close to the building. By this trap the gases from the cess-pool, and the tributary sewers GK and FK, will be cut off from access into the basement of the middle wing, in which there are several floor sinks provided only with bell traps. The joints of the new eight-inch tile with the old broken twelve-inch tile are to be made as securely as possible with cement.

In the sewers GK and FK much foul coating was found, which can, however, be removed by thorough flushing. At G, where the tile was broken for examination, I advised the construction of an eight-inch tile lamp hole temporarily for the purpose of occasional inspection, said lamp hole to be removed early in the spring, and its mouth to be meanwhile kept tightly closed.

The principal steam supply of the building is soon to be derived from a battery of boilers located in the new laundry building, and the main pipes are laid through a culvert, or tunnel, or subterranean passage, connecting the basement of the new laundry with that of the middle wing, as indicated in Fig. 1. In this underground passage the top of the large sewer GK is exposed, and to keep the floor of said passage dry, a line of drain tile has been laid just below said floor in each direction from the sewer GK. Directions were given by me to ascertain by actual excavation whether said drain tiles were tapped off from the sewer, and if such were not the case, to insert suitable vitrified tile traps with hand holes for filling with water, as shown in Fig. 3. The opening of said passage into the basement of the main building at M, in Fig. 1, was also to be closed up securely so as to prevent egress of any air from the passage into said basement.

In the basement of the boys' annex, all horizontal drain pipes were found to be of tile. These were directed to be removed and replaced by cast-iron soil pipes, and the polluted earth adjacent to said old tiles to be removed and replaced by clean earth. Owing to the difficulty of working in the frozen ground outside of the buildings, I have advised that the connection of the new main soil pipe in this annex with the present large sewer be made substantially as indicated in Fig. 4, with a trap separating the soil pipe from the sewer and cess-pool, and a fresh air inlet as shown. The design is to remove this inlet to some convenient point distant from the building as soon as the weather will

permit next spring. A similar arrangement may be used in the case of the girls' annex, but as the pipes have not yet been exposed therein no definite plan can now be proposed.

By referring to Fig. 1 it will be noticed that the sewers which receive the wastes from the water-closet, baths and sinks in the apartments A, B, and the basement of the middle wing, all run immediately under the cemented floors of said basements. Nothing definite is now known respecting the condition of said sewers, and I do not deem it prudent to take up and relay said sewers at present, since such work can better be performed in the summer when the air from the basement is not so apt to rise into the corridors and apartments above. If said sewers should prove to be defective, as was found in the same line outside of the building, it is obvious that the wastes from a *water-closet* should not be permitted to flow through said line under the basement, and hence I advise that either a *new outlet* should be found for the wastes from the closet and other fixtures in A, or else that the use of this closet be interdicted until such change can be made. In obtaining another convenient outlet a difficulty presents itself in the form of the large subterranean cistern between the middle and the boys' annex, the extent of which is not exactly known. To ascertain this I suggested an excavation in the yard so as to learn whether such an outlet of iron pipe could be located safely between the cistern and the adjacent walls of the basement entrance, and then be connected with the old sewer DK behind the trap which is to be inserted at D.

As to the connection of the cistern overflow pipes with the sewers, nothing definite has yet been learned, but the contractor will soon take measures to examine the same.

In consequent of the urgent requests that the trustees have received to open the institute as soon as possible, the contractor for the improvements, Mr. Siddons, was requested to concentrate all of his energies upon the fitting up of the water-closets, baths and washing trays in the boys' and girls' annexes, so as to admit of the speedy return of the pupils, and to perform the work of closet ventilation and the improvements in the apartments A after the above has been finished, since the latter work can be done without particular inconvenience to either contractor or inmates after the pupils have returned. The same may likewise be said of the work connected with the cistern overflows and the cleaning and ventilation of the cisterns themselves.

In consultation with experienced sanitary engineers and plumbers, it has been considered advisable to modify the plans already submitted in my former report so far as to provide each bath-tub with a separate and properly vented mechanical trap. With this addition the plans are now completed. A separation of the wastes from the bath-tubs and washing basins from those of the water-closets and slop-sinks was attempted in the boys' annex, but was abandoned in consequence of the liability to error on the part of the mechanics, and of the time that would be lost thereby. Should such a separation still be regarded as expedient by your board, it can be carried out afterward without much additional expense, and your advice on this point is earnestly desired.

Respectfully submitted,

EMIL KUICHLING,

Civil Engineer.

January 27, 1884.

To DR. ELISHA HARRIS, *Secretary State Board of Health, State of New York:*

DEAR SIR — In pursuance of your orders, I, in company with Dr. Townsend, of the board of trustees, and Mr. Siddons, the contractor for the work, visited the State Asylum for the Blind at Batavia, on the 20th of January, for the purpose of examining and testing the work done under the advice of the State Board of Health, in regard to its completeness and faithfulness of detail to the plans drawn up by Mr. Emil Kuichling, engineer of the Board of Health of the State.

I am pleased to report, that the work has been carried out in every detail as Mr. Kuichling suggested, and that in no way did the tests show any leakage of gas or siphoning of the traps. The ventilation in the western annex or boys' side of the asylum was excellent; in the eastern annex or girls' side the system was incomplete and we were unable to judge so positively. I advised them in the name of the State Board to accept the work and open the school as soon as they saw fit.

The system of sewerage is still unchanged, and until the village is sewered there seems no way to dispose of the sewage matter permanently. If the village could make some combination with the New York Central railroad and the State they might extend their sewer east two miles to a sewage farm and thus have a permanent method of disposal.

Yours truly,
RICHARD M. MOORE,
Sanitary Investigator.

DIPHTHERIA IN JOHNSBURGH, WARREN COUNTY.

DR. ELISHA HARRIS, *Secretary State Board of Health:*

DEAR SIR — I have the honor of transmitting to you the following report upon an epidemic of diphtheria which prevailed in the town of Johnsburgh, Warren county, during 1880 and 1881, and the results of the action of your Board and the local authorities in regard to the disease.

Johnsburgh is the most northern town of Warren county, and the largest in area — lying in latitude 43 degrees 40 minutes and longitude 74 degrees. Its population in 1880 was 2,742. It is bounded north by Hamilton county, east by the Hudson river, south by the town of Thurman, and west by Hamilton county, and is about eighteen miles square. The surface is very rough and mountainous. The principal streams have an easterly direction and all empty into the Hudson. Thirteenth pond brook, in the north, is about five miles long and enters the river near Eldridge hotel. North creek rises in Township 11, is about twelve miles in length, and enters the river near the present terminus of the Adirondack railroad. Mill creek, in the southern part of the town, rises in the south-western part, and flows twelve miles to the river, three miles below Riverside station. It is the largest stream in the town except the Sacandaga river, which cuts through

the town's wild territory on the west. The stream furnishes power for two saw-mills, two grist-mills and a tannery, situated at Weavertown.

It is now (December, 1883) some six years since the first sporadic cases of diphtheria occurred in the town of Johnsburgh, but so long a time has elapsed and the cases were scattered over so large a territory, that no attempt has been made, in this investigation, to go back of the fall of 1879. It has been impossible to get a complete history of all the cases which occurred from that date up to the close of 1881, but I have grouped them together, where possible, and have endeavored to show : 1st. The fearful ravages which the disease made in this sparsely settled and apparently salubrious region. 2d. The wonderful facility with which this fatal epidemic was spread from house to house by the carelessness and indifference of the inhabitants.

The attention of your board was directed to the town of Johnsburgh in November, 1881,by communications from Andrew Lackey, trustee of school district No. 3, who felt that his family were jeopardized by the continued spreading of the disease and the neglect of all sanitary precautions by those afflicted. I was directed to visit the locality and to urge upon the proper authorities the necessity of immediate and thorough action.

My investigation in December, 1881, revealed the grossest carelessness in the management of many cases. Partly from ignorance and partly from an impression that the disease is not contagious, there was much calling upon the sick, public funerals were common, and very slight precaution was taken to prevent the spread of this dread destroyer of children. Within the two years covered by this report, I have the record of upwards of one hundred and twenty cases, with a mortality of over sixty per cent.

As a result of the interest taken in the matter by your Board, the town board of health was organized shortly after my visit, rules and regulations were adopted and enforced, forbidding public funerals, and directing that prompt and efficient means be employed to prevent the further spread of the disease.

In November of this year (1883) I again visited Johnsburgh to complete the investigation entered upon two years before, and to learn with what success the further inroads of the disease had been combatted. I ascertained that almost immediately after the action of the town authorities, above referred to, and the resulting enlightenment of the community regarding the necessity for thorough sanitary measures, the disease began to abate ; and that during the two years intervening between my visits, there had been only isolated cases here and there, until the present fall. Since October 1, another group of cases has occurred, a supplementary report of which will be sent in due time. Previous to the appearance of this group the death register in the town clerk's office showed but one death from diphtheria during 1883.

Many sad histories have been heard in the course of this investigation which cannot be repeated here. Enough has been learned to prove what has been often proved before, that diphtheria is a highly contagious disease, that is, can easily be spread over a wide extent of territory by carelessness and indifference to precautionary measures, and that prompt and efficient regulation will positively check its fur-

ther ravages and keep it under control; and further, that diphtheria in Johnsburgh was imported, at the outset, was spread by neglect of well-established sanitary principles, and was checked by the tardy but efficient enforcement of proper sanitary regulations.

In the following enumeration of cases, the groupings and tracings of contagion are far less complete than I intended at the outset. But the wide extent of territory over which the disease prevailed, and the lapse of time since its prevalence, has made a more perfect history impossible, without incurring too great an expense.

The map which accompanies this report is intended merely to show the relative localities of the fifty or more families in which the disease occurred, and the numbers on the map correspond to those in the subjoined list.

Detailed Report of Cases.

1. The first case in the group now under consideration, probably occurred in the family of George Hodgkins, near Baker's Mills. Hodgkins came from Dexter, Maine, in the spring of 1879, and worked as night watchman at the Reedsville tannery. Six months later he sent for his family who had remained in Dexter, and settled at Baker's Mills. Three or four weeks after his family came, his child was taken with diphtheria, and died in November, 1879. The Reedsville tannery is on the road from Wellstown, where diphtheria had occurred previous to this time, and doubtless the contagion was introduced from that direction, both in the case of Hodgkins' child and Harrington's wife, number 22, below.

2. Mrs. N. Turner assisted in the care of Hodgkins' child, and as a result, four cases occurred in her family, with two deaths.

3. E. de Morris and J. Kibbie lived in the same house. Mrs. Kibbie helped lay out the Turner children, and carried home the disease. In the two families there were five cases and two deaths.

4. Henry Morehouse's boys sat up with the Kibbie children and four had diphtheria, but all recovered.

5. Z. Lackey lived in the same house with a family by the name of Fuller. There was visiting back and forth, from Morehouse's, No. 4, during the sickness there. At Lackey's house there were five cases and four deaths.

6. John Morehouse sat up at Lackey's with the sick, and one death followed at his house.

7. Freeman Smith sat up at Lackey's, No. 5, and attended funerals of Lackey's children. Four cases and three deaths resulted in his family.

8. J. P. Baker lived across the road from Hodgkins. His boy called at H. Morehouse's, No. 4, during sickness there. Had disease but recovered.

9. W. H. Morehouse, five cases, no deaths.

10. J. Dunlap, one death.

11. Mrs. P. Lackey assisted Mrs. Kibbie, No. 3, to lay out the Turner children, No. 2, and her children had disease, but recovered.

12. Geo. Dunklee, living south-west from Hodgkins', lost three children, and J. Lamb, living in same house, lost one.

13. T. Bills' family had three cases with two deaths.

14. J. Dalybee lost one child.
15. A. Wescott lost one child.
16. J. Wescott lost three children.

The connection of these last cases with the original group at Baker's Mills cannot be made out, but all occurred in the same locality. On the road to Oregon other cases occurred as follows:

17. J. Madison's family, two deaths.
18. D. Wilcox's family, one death.
19. L. Robbins' family, one death.

20 and 21. J. Sawyer and Will White, living off the direct road, were at Robbins' during the sickness there, and carried home the disease, Sawyer losing one child and White losing two children.

22. At Reedsville, south-west corner of town, J. Harrington's is a stopping-place for travelers from Wellstown. Harrington's wife came down with diphtheria about the same time as Hodgkins' child, No. 1. There were two deaths at Harrington's.

23. John Morehouse, a neighbor of Harrington's, had two cases, both recovered.

24. F. Barrows had two cases in his family, one proving fatal.

25. J. Swaim had two cases, both died.

26. H. Richards, five deaths.

27. J. Terrell, one death.

28. A. Jenks, a lumber teamster, passing through Johnsburgh during prevalence of disease, carried it home, and three cases occurred in his family, all recovering..

In the following cases no attempt has been made to arrange in the order of occurrence:

29. Nicholas Ward, two cases, one fatal.
30. J. Carter, disease taken from Ward's, probably, one death.
31. John Wakeley, lost one child.
32. L. Morehouse had three cases and one death.

33. Wm. Lackey, Jr., two cases, one fatal. Lackey was at H. Morehouse's, No. 4, and assisted in the care of the sick.

34. Robert Smith's children played with doctor's scarf, which Lackey's girl had played with.

35. Rev. A. W. Smith called to pray with Swaim's family, No. 25, at a time when one child lay sick and another dead, in the house, from diphtheria, being very weary and suffering from a cold, contracted the disease and carried it home to his family. He, himself, was very ill, and has not yet recovered from the effect of the disease. Five other cases occurred at his home, and three children died.

36. Bethuel Comstock lost one child. Probably disease communicated from Wescott, No. 15, his brother-in-law.

37. J. Barney's wife washed for Comstock's family at time of sickness there, and two children had disease, but recovering.

38. At J. Bates' there were two cases, which recovered.
39. At A. Dunlop's there were two deaths.
40. At Wm. Bates' two cases recovered.
41. C. Labrum lost two children.
42. C. Baker lost two children.
43. A Waddell, living north of Weavertown, lost five cases.

44. P. Moston, undertaker, living at Weavertown, had one child very ill at time of my first visit. The child recovered, however.

45. At A. Pitts', Weavertown, there were three deaths.
46. At B. Balcon's, one case which recovered.
47. At J. M. Campbell's, two deaths occurred.
48. S. Galusha had three cases, one fatal.
49. J. Galusha, two fatal cases.
50. Jabez Waddell, two fatal cases.
51. Robert Johnson had two cases, both recovered.
52. Walter Parks lost one child.

The following families are not located on the map :

J. G. Cole had four cases in his family, two proving fatal.

T. S. Sommerville had the same number as Cole, two dying.

J. J. Richards had two cases, both recovering.

While it would be more satisfactory to me if I could have traced every case to its source, yet I think the above list contains sufficient evidence to show that the disease was spread over the town of Johnsburgh by an indifference to proper precautions which was almost criminal; while the array of cases is enough to show how wide-spread was the epidemic. The following table presents the cases in a compact form:

DIPHTHERIA IN JOHNSBURGH IN 1879–81.

No. of map.	NAME OF FAMILY.	No. of cases.	No. of deaths.	Date when known.
1	G. Hodgkins	1	1	November, 1879.
2	Mrs. N. Turner	4	2	
3	de Morris & Kibbie	5	2	
4	Henry Morehouse	4	0	
5	Z. Lackey	5	4	Dec., 1879–March, 1880.
6	John Morehouse	1	1	
7	Freeman Smith	4	3	
8	J. P. Baker	1	0	
9	W. H. Morehouse	5	0	
10	J. Dunlop	1	1	
11	Mrs. P. Lackey	1	0	
12	Geo. Dunklee	4	4	
13	T. Bills	3	2	
14	J. Dolybee	1	1	
15	A. Wescott	1	1	
16	J. Wescott	3	3	
17	J. Madison	2	2	
18	D. Wilcox	1	1	
19	L. Robbins	1	1	June, 1881.
20	J. Sawyer	1	1	
21	Will White	2	2	
22	J. Harrington	2	2	November, 1879.
23	John Morehouse	2	0	
24	Fre. Barrows	2	1	
25	J. Swain	2	2	November, 1880.

DIPHTHERIA IN JOHNSBURGH IN 1879–81.— *Continued.*

No. of map.	NAME OF FAMILY.	No. of cases.	No. of deaths.	Date when known.
26	H. Richards	5	5	
27	J. Terrell	1	1	
28	A. Jenks	3	0	
29	Nicholas Ward	2	1	
30	J. Carter	1	1	
31	John Wakeley	1	1	September, 1880.
32	L. Morehouse	3	1	
33	Wm. Lackey, Jr.	2	1	November, 1881.
34	Rob't Smith	2	2	
35	Rev. A. W. Smith	6	3	November, 1881.
36	Bethuel Comstock	1	1	February, 1880.
37	G. Bamey	2	0	
38	J. Bates	2	0	
39	A. Dunlap	2	2	
40	Wm. Bates	2	0	
41	C. Labrum	2	2	
42	C. Baker	2	2	
43	A. Waddell	5	5	
44	P. Mosten	1	0	
45	A. Pitts	3	3	
46	B. Balcom	1	0	
47	J. N. Campbell	2	2	
48	S. Galusha	3	1	
49	J. Galusha	2	2	
50	Jabez Waddell	2	2	
51	Rob't Johnson	2	0	
52	Walter Parks	1	1	
53	J. A. Cole	4	2	March, 1880.
54	T. S. Sommerville	4	2	March, 1880.
55	J. J. Richards	2	0	April, 1881
	Total	130	80	

Most of the details of the foregoing report were obtained from A. Lackey and his sister, who had excellent opportunities for observing the disease at Baker's Falls. All of which is respectfully submitted,

JAMES S. COOLEY, M. D.

LUZERNE, N. Y., *December* 15, 1883.

To ELISHA HARRIS, M. D., *Secretary of the State Board of Health;*

DEAR SIR — In compliance with the request in your communication of November 5, that the investigation concerning the epidemic of diphtheria in Johnsburgh, in 1880 and 1881, should be completed

for the purpose of showing more especially, first, what neglect and what faulty practices or circumstances are known to have spread the disease; and second, what reforms in these respects were secured, and what results followed, I have the honor to submit the following report, etc.:

As a result of the interest taken by your board in this matter, the board of health of the town of Johnsburgh was promptly organized, a few days after my first visit, and the following "rules and regulations" were adopted. I quote those sections only which have a bearing upon the subject of this report:

"SEC. 4. Any householder in whose dwelling there shall occur a case of cholera, typhus or typhoid fever, scarlet fever, diphtheria or small-pox shall immediately notify the board of health of the same, and until instructions are received from the said board of health, shall not permit any clothing or other property that may have been exposed to infection to be removed from the house; and all physicians and other attendants upon any person sick with the small-pox, cholera, typhus, typhoid, or typho-malarial or scarlet fever, diphtheria, or other disease dangerous to the public health, shall forthwith report the same to the board of health, and it shall be the duty of such physicians and attendants to avoid exposure to the public of any garments or clothing about their own persons that may have been infected by any exposure from such disease.

"SEC. 5. No person or article liable to propagate a dangerous disease shall be brought within the limits of this town without the special permit and direction of the board of health thereof, and whenever it shall come to the knowledge of any person that such person or article has been brought within such limits he shall immediately give notice thereof to the said board of health, together with the location thereof; nor shall any person by any exposure of any individual sick of any contagious disease, or of the body of such person, or by any negligent act connected therewith, or in respect of the care or custody thereof, or by a needless exposure of himself, cause or contribute to or promote the spread of disease from any such person, or from any dead body; and it shall be the duty of this board to order such separation and isolation or domestic quarantine of the sick from other persons not necessary as attendants, and also such special care and disinfection as shall be needed, in order to prevent the spreading of such disease to others.

"SEC. 6. There shall not be a public or church funeral of any person who has died of small-pox, diphtheria or scarlet fever, and the family of the deceased is requested to limit the attendance to as few as possible, and to prevent the presence, so far as they are able, of those who have not had the disease of which the deceased person died, and it shall be the duty of householders and all persons concerned where a death occurs from any contagious or pestilential disease to prevent needless assembling in the apartment and house where such are of all persons liable to become infected thereby."

These regulations were adopted December 12, 1881, and were immediately printed and posted in all parts of the township. In the main their provisions were complied with by the inhabitants, who have reason to rejoice that this tardy but effectual action of their board was

followed by such excellent results. These rules and regulations have been indorsed by the board of health each year, and are still in force.

To emphasize the lessons of this fatal epidemic a few points may, with profit, be considered more in detail. From whatever source the contagion was received in 1879, it is clear that the two groups of cases, one at Reedsville and the others at Baker's Mills, occurred nearly at the same time, and probably originated from the same source. From these two foci it is quite likely that all the other cases were derived. At Reedsville, Mrs. Harrington died of diphtheria in October, 1879, and her remains were taken to Wells for burial. As appears from Dr. Beach's report on the epidemic in Wells, page 116, First Annual Report of the State Board of Health, the remains of Mrs. Harrington were left for a time at the house of H. Early, in that village, and her two boys both had the disease in Wells, one dying there. Following upon the death of Mrs. Harrington, there were some twelve cases with nine deaths in the immediate vicinity of Harrington's place at Reedsville; but I have not been able to get the facts as to the manner in which it was transmitted.

Referring again to the group of cases at Baker's Mills, it appears that Geo. Hodgkins' child had the diphtheria late in 1879, and that Mrs. N. Turner *assisted in caring for it*, thus carrying to her own family the fatal disease of which two children died. Mrs. Kibbie and Mrs. P. Lackey, neighbors, *helped lay out* the Turner children, and their families, in turn, are the victims. Henry Morehouse's boys are *night-watchers* with the Kibbie children, and they, too, are smitten down. Between Henry Morehouse's and Z. Lackey's there is *free visiting* during the progress of the disease, and in Lackey's house the fell destroyer appears. Wm. Lackey was also at Morehouse's rendering assistance, and his family suffer in consequence. While Z. Lackey's children are ill, Freeman Smith and J. Morehouse, neighbors, are *night-watchers*, and carry to their families the fatal contagion. The kindly wish to aid each other in the hour of affliction becomes the means of spreading yet more widely the dread disease.

One of the families which suffered at Reedsville was that of J. Swaim. While one child lay dead in the house, and a second child was ill, the Rev. A. W. Smith, pastor of the M. E. church at Johnsburgh, eight or ten miles distant, was at Swaim's and offered prayer. Mr. Smith was very much fatigued, was suffering from a severe cold, in a most excellent condition to contract the disease, and was taken shortly after his return home. He survived, but has not fully recovered from the effects at this date, and three children were buried. While the disease was in progress at Smith's, slops were thrown out upon the highway, within a few rods of a neighbor's house. After the death of one of the children, the straw-bed was emptied upon the ground and the contents left to be blown about by the wind. Previous to the action of the board of health, the funerals were public and freely attended. A few persons there were who attempted to take precautions against the disease. But they were looked upon as uncharitable and hard-hearted, because they were unwilling to risk the exposure of their own children.

The foregoing report illustrates, in a forcible manner, the same points which were established by the investigation in West Chester-

town and Minerva, as shown by my report published in the second annual volume of the State Board of Health, pages 90–94, and should be sufficient to convince the most skeptical that diphtheria is exceedingly contagious and that it can be substantially repressed and subdued by proper sanitary measures.

ALL DEATHS REGISTERED IN JOHNSBURGH FROM DIPHTHERIA.

DATE.	Sex.	Age.	In what part of town.	What more is known.
1883.				
July 7....	Male ..	20 yrs.	School Dist. No. 12, eastern part of town, 4½ miles from Weavertown, N. Y.	4, all in one family.
July 11...	Male ..	8 yrs.		
July 22...	Male ..	1 yr.		
July 22...	Male ..	11 yrs.		
October 21	Male ..	4½mo.	School Dist. No. 12, eastern part of town, 4½ miles from Weavertown, N. Y.	
Nov. 25...	Female	2 yrs.	School Dist. No. 12, eastern part of town, 4½ miles from Weavertown, N. Y.	3, all in one family.
Dec. 6....	Female	13 yrs.		
Dec. 13...	Male ..	16 yrs.		
Dec. 8....	Male ..	5 yrs.	School Dist. No. 12, eastern part of town, 4½ miles from Weavertown, N. Y.	

RUBEOLA AT BERGHOLTZ.

LOCKPORT, N. Y., *May* 12, 1883.

Mr. President and Gentlemen of State Board of Health :

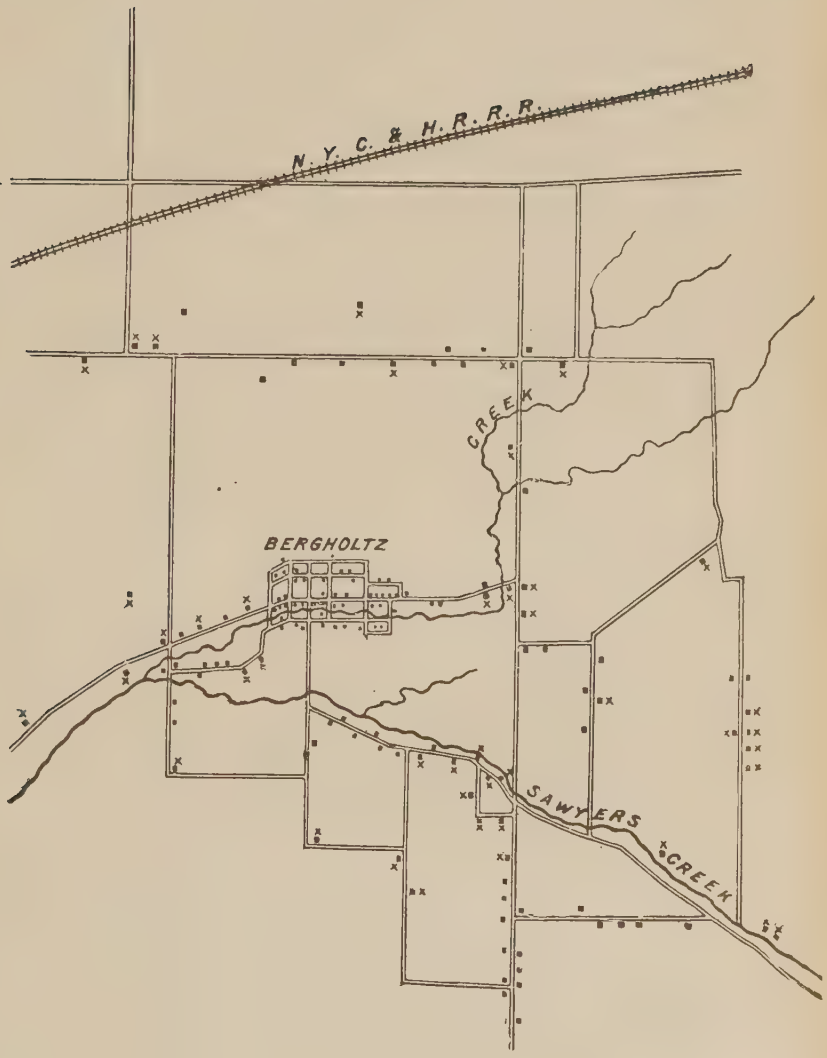
GENTLEMEN — I have the honor to present the following report of the epidemic now prevailing in the town of Wheatfield, villages of Bergholtz and St. Johnsburg and vicinity:

Bergholtz is a small village of about two or three hundred inhabitants. Situated about three miles south-west of Sanborn station on the New York Central railroad, the population is *entirely German*, and a large percentage might be called *floating*, for the reason that they only *make it a temporary stopping-place until money enough is earned to take them farther west.*

The houses are mostly low one-story frame structures and having no cellars or foundations of stone, nearly all with sills resting on the ground, so that dampness is the rule ; the new houses are exceptions and more modern.

There are *four schools* in Bergholtz; three parish schools, under the care of the Lutheran churches, and one district school. The parish schools are attended by children from the surrounding country, some coming three or four miles, and of course by the village children as well. The district school is slimly attended, and is run long enough to simply use up the public money and then discontinued for the balance of the year.

On March 23, *John Gardir*, wife and two little girls, one five years of age, the other about three years, landed in New York city ; they arrived in the steamship California of the Carr-Hamburg Line after a


N. Y. C. & H. R. R. R.
CREEK
BERGHOLTZ
SAWYERS CREEK

passage of fifteen days; the woman states that there were "some deaths" on board, but she saw none sick; did not know whether there was one death or one dozen.

She went to No. 18 Greenwich street, and remained one day and one night and then came directly to Bergholtz. While in New York the eldest of the two children began to cough, continued to cough at intervals until April 2, when an eruption appeared on face and neck and in two days spread over entire body and remained out about seven days; faded suddenly and pneumonia set in, involving the right lower lobe, continued six days and suddenly began improving, and soon she was about the house; the doctor did not see her until toward the close of the first week of her illness, just as the pneumonia was showing itself. Temperature was 105⅘ degrees, eruption was fading but still retained form enough to convince the doctor that it was the measles, and the hæmorrhagic variety, the skin presenting a black and blue or ecchymotic appearance; besides the pneumonia the case was complicated by the presence of enteritis, patient having from six to twelve passages in twenty-four hours, some green and black and some plainly showing blood present, all having a slimy appearance.

On the 9th of April, the youngest was taken sick; after having coughed a little for two or three days, an eruption appeared on face and neck and in two days spread over entire body, remained out three days and suddenly disappeared and a profuse diarrhœa came on and was of same character as preceding case. This case the doctor saw at its beginning and pronounced measles. Both recovered.

April 23, the disease appeared in the family of August Breaker, four children in the family. Breaker in common with other neighbors procured milk from family living next door to the place the Gardirs were stopping at, and before the doctor arrived they had been in the habit of going in where the child was sick; Breaker's children all took it. (Breaker's children all had rotheln in winter of 1881, at which time it was very prevalent throughout Niagara county.)

From Breaker the disease spread over the entire village, and through the medium of the schools it has spread in the surrounding country. In Bergholtz there have been in all about forty or fifty cases and I am told by Dr. Huggins that there have been in all about 100 cases or more; undoubtedly many are not reported; and in a large number, in fact in most of the cases, the doctor has not been called until the disease was fully established or subsiding and pneumonia was present, as a complication or sequela. In St. Johnsburg there have been seventeen cases. No new cases reported in either place for a few days.

I had the opportunity of seeing seven cases with the eruption in a condition to be intelligently described, and as they are, with one or two exceptions, exactly similar in appearance, I will simply describe a typical case. Carl Behm, age three years, about two weeks ago began to cough, continued to cough for six or seven days, when an eruption appeared on face and neck and in a few days had covered the entire body; at first it was bright red, it has gradually grown darker, and to-day, the seventh of the eruption, it covers the entire body except the face and scalp; it is *purpuric* and slightly *elevated*, consists of *rings*, crescents and molecules, separated by spots of normal skin; he is suffering from bronchitis and has had a *diarrhœa* averaging five or

six movements daily for the past week, color black and green, one containing some *blood and mucus;* his temperature to-day under tongue was 100 degrees; pulse 98. There has been one case of rotheln. Following history: Sick about two days when an eruption appeared covering entire surface within twenty-four hours, remained about forty-three hours and suddenly disappeared, child feeling as well as ever (apparently), the eruption was not elevated, consisted of patches of punctate red spots, rings and excrements.

The doctor informed me that he had had three cases of scarlatina; I saw two whom he stated had been having the disease, they were nearly disquamated, tongues were red at tips and one had otorrhœa.

There have been four deaths, all from pneumonia, complicating or occurring as a sequela of measles.

I saw but one that appeared to be in immediate danger that was *suffering from pneumonia* as a complication of measles and had the characteristic eruption and it had not yet reached the *dark hue** which later on seems to be *present* in *all these cases.* This is one of the exceptional cases referred to on page 4 of my report. Another case eruption was same shade.

Situation at present is this: All the schools are closed at Bergholtz and St. Johnsburg. Nearly all susceptible in Bergholtz have had or are having the disease in the vicinity. And in St. Johnsburg (a struggling settlement on the main road) it is probable there will be more cases.

I saw the supervisor, *C. F. Goerss,* of Bergholtz; he is willing to do all in his power to assist in disinfection, etc.

Dr. Huggins of Sanborn appears to have all the cases in Bergholtz and immediate vicinity.

The town has no health physician appointed. I suggested the appointment of Dr. Huggins, and am snre that he will see that thorough fumigation and cleansing is done, and also attend to the disinfection of clothing, etc., by zinc-salt solution. I took the liberty of telling the supervisor that Dr. Harris, secretary, would probably write him on Monday, in relation to the necessity of a prompt meeting of the board of health of the town, and the appointment of Dr. Huggins as health officer with power to take such steps as he thinks are required in the way of fumigation, disinfection, etc. And the closing and opening of schools for strict quarantine is impossible unless a cordon is established. Thanks are due Dr. Huggins for his prompt action in closing the schools and the honorable supervisor for his co-operation in the matter, and the assurance that he has given, that he will continue to do all in his power to assist in preventing the further spread of the disease.

Dr. Huggins tells me that the temperature has raised from 102 degrees to 105⅘ degrees in different cases.

There was photophobia and coryze in most cases.

Respectfully submitted,

W. J. RANSOM.

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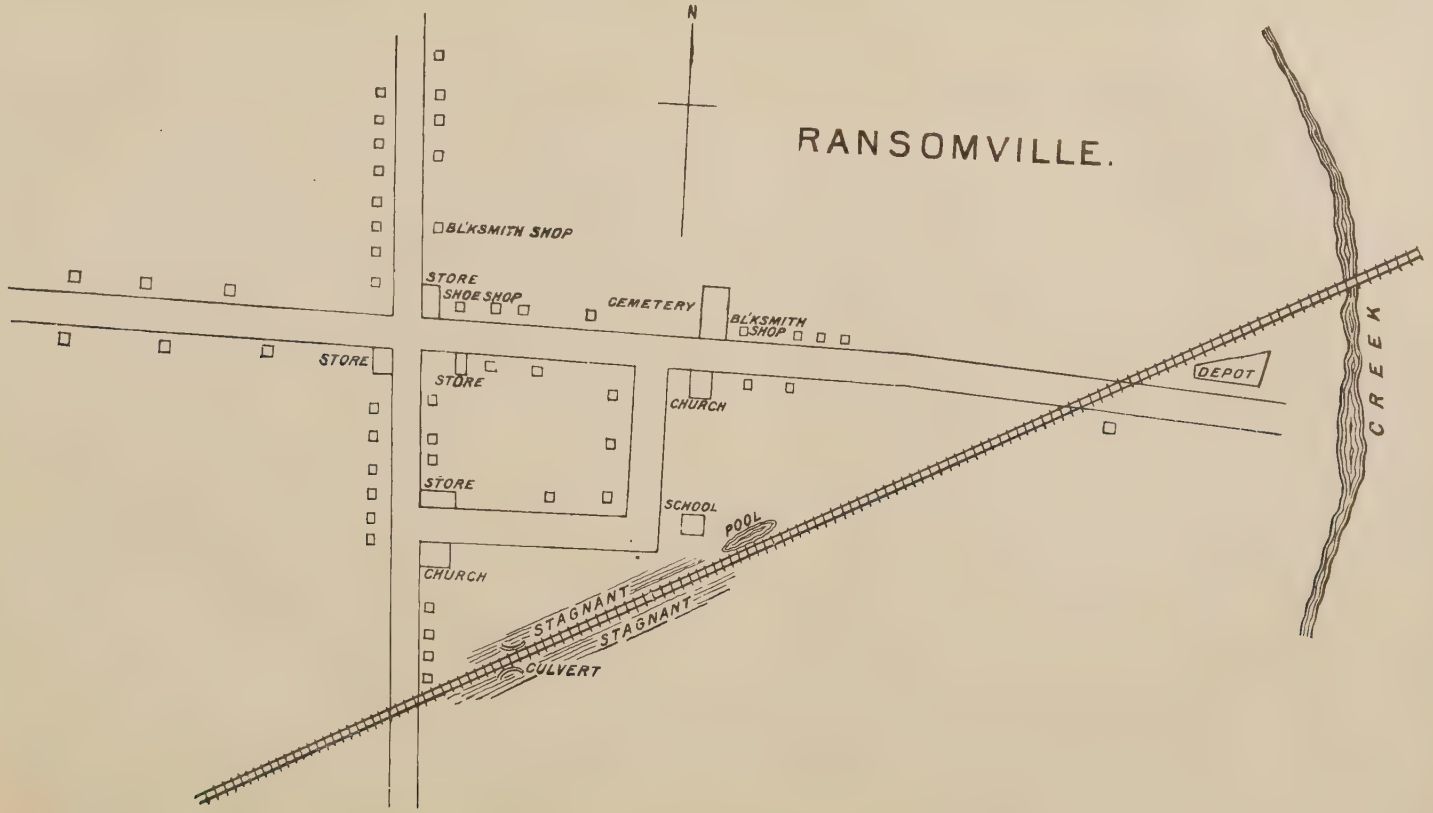
*This brown is doubtless from blood disorganization. Hæmatoidine may be found, if so.


N
RANSOMVILLE.
BL'KSMITH SHOP
STORE
SHOE SHOP
CEMETERY
BL'KSMITH SHOP
STORE
STORE
CHURCH
STORE
SCHOOL
POOL
CHURCH
STAGNANT
STAGNANT
CULVERT
DEPOT
CREEK

Lockport, N. Y., *May* 29, 1883.

To the State Board of Health :

Gentlemen — I have the honor to report progress in the investigation of the recent epidemic of rubeola which began in the village of Bergholtz, township of Wheatfield, county of Niagara, on April 2. March 23 John Gordir, wife and two children landed at Castle Garden, New York, from the steamship California, of the Carr-Hamburg line. They remained one day and night in New York, and leaving, arrived in Bergholtz on April 1. One of the children had a troublesome cough at New York and cough continued until on second day after arrival in Bergholtz an eruption appeared. A physician, Dr. Huggins, of Sanborn, was called and pronounced it rubeola, and warned the family against communicating with other families in the place in the way of visiting or allowing neighboring children to visit them. The doctor's advice was not entirely acted upon, and some children did not remain away but went in to visit the newly-arrived and attended school, and in the course of two or three weeks the number of cases was suddenly increased by a large number who came down with the disease. The doctor ordered the schools closed immediately and notified the State Board through its secretary, Dr. Harris, and I was ordered to investigate and report. On my first visit I had an opportunity to observe a few cases, ten or more, with a peculiar petectial or purpuric eruption resembling purpura, except that the spots presented the characteristic shapes of rubeola eruption, viz., crescent rings and spots of various shapes, all slightly elevated. The eruption appeared in all these cases after a condition of general malaria cough, coryza, and in most cases conjunctivitis and was accompanied in this class of cases at the outset by a high temperature. The doctor (Huggins) informed that in one case the temperature was 105⅕ degrees.

A typical case of the petectial or purpuric form which came under my observation at first visit has the following history :

May 12. Carl Bohm, aged three years, began to cough two weeks ago ; cough continued for about one week when an eruption appeared on face and neck, and in two or three days the body was entirely covered and the eruption remains at this time. It consists of crescentic and ring-like spots irregularly distributed over surface of body and limbs, traces on face and neck, most distinct on lower extremities and abdomen, and patches irregular in shape, the whole surface presenting a black and blue appearance or like purpuric without the local swellings or effusions *under* skin. His temperature in axilla is 100 degrees, pulse 100 degrees. He has a cough and mild conjunctivitis of lids. He has had diarrhœa constantly for the past week, averaging five or six movements daily ; said to be black and green, stringy and containing some blood. He is one of a family of six children ; the oldest attend school and have just recovered from the measles. One of the other children is now in the midst of an attack of measles running ordinary course and is about the house. It has been very difficult to get a connected history of many of the cases so as to definitely fix the period of incubation. The population is entirely German or Dutch, and the territory occupied by them quite large in extent. In the town of Wheatfield alone probably twenty square miles are occupied by the above class.

There have been in all about two hundred cases to date. I have been fortunate enough to observe five cases, in three of which I have been able to fix the period of incubation at fourteen days before the appearance of the eruption, and in which the disease was given by a patient on whom the eruption was not *noticed* until the following day. On the first day of May, Garret Male, aged ten years, living about five miles from Bergholtz, where he had been with his parents about two weeks before. At that time they were convalescent from measles at Gordir's, but there were cases at the Widow Nieman's and none others reported, and no more were reported until the twenty-first of April. On May first the boy above named went to visit his sister's children at the place of their father, Charles Hilderbrandt, one-half mile distant, and he was the only child who visited them. They (the children) had not left the house nor received any visitors for two or three weeks previous, nor had they after that time up to the date of my visit. Garret had a severe cough at the time he was playing with the Hildebrandt children. After reaching home that night he became worse and the next morning was noticed to have a rash on face and neck, which in two days spread over his body and limbs, remained four days and disappeared. No physician was called. In about twelve days after his visit to the Hildebrandt children they began to cough and continued to cough until the fifteenth of May when a rash appeared and they all were quite sick. I saw them on the nineteenth. Their condition was as follows:

Boy, aged three years, pulse 114, temperature (axilla) 102⅓ degrees; respiration, hurried; physical signs of general bronchitis; conjunctivitis of lids; coryza.

Girl, aged nine months, pulse 126, temperature (axilla) 100¾ degrees; cough; coyza; conjunctivitis of lids.

Girl, aged five years, pulse 106, temperature (axilla) 100¾; cough, coryza; conjunctivitis of lids.

The eruption in these cases was typical of rubeola. The two girls had epistaxis every day of eruption up to date of my visit. The eruption was not hæmorrhagic. On the same day I visited the above-named cases I visited the Garret family. Then I found the boy who had been playing with the Hildebrandt children thoroughly recovered, but his two brothers, August and Charles, in bed sick with rubeola, in the following condition:

August Garret, aged twelve, pulse 104, temperature 102½ degrees, axilla.

History. — Began to cough about seventeen days ago. Three days ago eruption appeared.

Present condition. — Temperature and pulse as above. Characteristic eruption of rubeola covers body and extremities. Has a cough, coryza, general conjunctivitis and back ache and constipation.

Physical signs. — Of simple bronchitis, sonorous and large sibilant roles.

Charles Garret, aged about fourteen, temperature 99⅔ degrees, pulse 106 (at about 3 P. M.).

History. — Has coughed for a day or two.

Present condition. — First noticed a rash this morning. It is profuse on face and neck and is faintly apparent on abdomen, chest and extremities as far as visible. Has the appearance of rubeola. On passing hand over surface an elevation of spots is noticed.

The preceding cases are the most valuable ones observed in regard to the period of incubation and in regard to the absence of cough preceding some of the cases less than the usual one or two weeks.

In two of the cases where there had been daily epistaxis all the other symptoms seemed to be mitigated.

The epidemic was well under way before my first visit, and I was unable to observe the first crop of cases. Dr. Huggins kindly furnished me with a list of names of families, and number of cases; there were forty-three families afflicted during April, and in those families 162 cases; all but thirty-seven were in Bergholtz and near vicinity; the thirty-seven cases being in St. Johnsburg and vicinity about one and a half miles south-east of Bergholtz, and all Germans. Although the doctor cautioned the family about allowing children in the house they were visited by a number of children who were sent from different parts of the village to the house next to where the Gardirs were stopping, and they found it convenient to call on the strangers, and they each carried away a dose of measles as a memento of their visit. Period of incubation as observed by Dr. Huggins was fourteen days. There have been eight deaths, all from pneumonia, as a sequela. Another way the contagion has been spread, and to a greater distance than before, was by wedding festivities near Bergholtz during the early part of May, about the fourth or fifth. Some child or children must have been there sick with the measles, as just two weeks after it appeared in two families in Martinsville, about six miles from Bergholtz, and I am informed has appeared in the town of Lewiston.

Respectfully submitted,

WALTER J. RANSOM.

LOCKPORT, *May* 31, 1883.

State Board of Health:

GENTLEMEN — I have the honor to report the result of an investigation as to the origin of rubeola prevalent in Ransomville, town of Porter, county of Niagara, and will state that I found it in no way connected with the epidemic at Bergholtz.

A laboring man with wife and one child came from Canada (Drummondsville) several weeks ago. Twelve days after arrival the child was taken sick with an eruptive disease; was not very sick and no physician was called. They formed a part of their employer's family and several of his children attended school regularly and soon were taken sick in the same manner; all mild cases. Dr. Long was called and pronounced it rubeola and did not find it necessary to prescribe, directing them to send word if they needed any attendance. No difference was made about attending school and the disease has spread so that up to date there have been about twenty cases, about half of the school.

The board of health was organized Saturday last at my suggestion, I having met the supervisor a day or two previous. Dr. S. Long is health officer.

Before to-day children from infected families have been attending school regularly and regularly coming down with rubeola. I suggested that they forbid the practice and order them to remain at home

until permitted by the health officer to return and resume attendance. I further suggested fumigation and disinfection as far as practicable. The board of health seem desirous of making a record and doing their duty.

I saw four of the cases and they are rubeola of a mild type. No deaths have occurred.

My attention was called to a large pool of stagnant water within about five rods of the school building. It is on the land occupied by the Rome, Watertown and Ogdensburg railroad, alongside the track, and could be easily drained by the company. It is three or four feet deep, about six rods long and eight or ten feet wide, and dangerously near the play ground, deep enough to drown a little child and should be attended to. The banks are steep. On either side of the embankment extending for thirty rods or about that distance there is considerable stagnant water which will remain there until evaporation occurs unless properly drained away.

Respectfully submitted,
WALTER J. RANSOM.

Rochester, *May* 29, 1883.

To Dr. Elisha Harris:

Dear Doctor — I have visited the infected district twice at a week's interval, and have seen forty to fifty cases of the measles. In no case could I find any malarial or other cause for the severity of the disease, other than the close herding of the children in small rooms and in a manner thus concentrating the poison.

The deaths which have been few in the number sick, and the apparent severity of the disease, were from pneumonia and bronchitis, and directly traceable to the careless exposure of the children to damp and cold.

The children are all well-fed, healthy children, as are also the parents.

The soil is a heavy clay that holds the surface water for a long time with a substratum of rock limestone, I think.

Malarial diseases are not rife here.

The houses are poor and cellarless.

The whole thing resolves itself into the introduction among a people, few of whose children have had measles, of a case of unusual severity, the disease spreading, as you will see by our report, by direct contagion in each case.

Yours, etc.,
RICH. M. MOORE.

Ellicottville, N. Y., *May* 21, 1883.

Dr. Elisha Harris, *Secretary, etc., Albany, N. Y.:*

Dear Sir — Your favor of the 28th ult. was duly received. We have no board of health and no health officer. Our town is the "steerage" of the county, being about half foreigners, who don't

mind rotting — "deaconed" calves, filth and surface drainage, bad wells, cellars, etc. (There ought to be a rigid law compelling local authorities to enforce sanitary regulations.)

Reeking privies, drains and cess-pools are the order of the day in county towns.

I had a conversation with one of our physicians recently upon these topics, and he agreed with my views above. He said he had not detected any "winter cholera." I never heard of the expression before receiving your letter, and don't know what it is. But if it is a condition of the atmosphere, resulting from poisonous and malarious exhalations that exist to a very unusual degree, this section of the country, since the first winter heavy thaw, has been infested with it worse than Egypt was with lice. Round about us and all about us, scarlet fever of the most malignant kind is raging — some dying within sixteen hours after the first attack, notably in Fredonia, Chautauqua county (and Machias, in this county, where they have a large amount of swamp).

The measles first started in Randolph (near the Connewango swamp) last winter — and of a terribly malignant character — moved eastwardly mowing a swath through the town of Napoli — skipping Little Valley (a dry healthy tract) (Napoli having a large swamp), and striking our "steerage" town, and stopping here, except the later Machias scarlet fever type of the matter.

It is noticeable that every ailment has been greatly aggravated all about us, for some reason. The mortality among the aged, the weakly, sickly and infantile has been *unprecedented.*

Also, pneumonia has prevailed to a very unusual and fatal degree — I believe being caused by the low condition of the body, incited to action by colds slight or serious. Again recently, the mother of Editor Vincent of the Olean *Times*, came to visit him in Olean, this county, about a month ago, was taken sick and died; and the physicians there pronounced it *genuine cholera.*

Olean has a sluggish canal and much low ground and bad drainage, and I consider it an unusually unhealthy place.

I believe, as I wrote to you before, that all this is the result (*i. e.* the excessive phases of it) of what I call a *low water winter.* All last fall the majority of our wells were dry as were the streams, and this state of the water continued until the big floods and thaws of early February, when the aggravated sicknesses came on.

Farmers had to melt snow to water their cattle. Thus, all the dead animal and vegetable matter of 1882 was unabsorbed by the earth in the fall, owing to the drought and remained on the surface, and when moistened by the wet of 1883, proceeded to poison all creation. I have noticed and heard of numerous birds of different species being found dead on the ground this spring. Butter and cheese buyers report to me that the butter from cows this spring is *disgustingly* poor — much of it — and they attribute it to the unhealthy condition of the cows. The yield of milk is unusually poor and small. My own cow has been in prime condition, for she has been well kept and cared for, and watered with the water that comes from my pure hill spring in an iron pipe. The doctor promised to furnish me some facts for you. *Nous verrons.* You will doubtless smile at my scientific dissertations. Amen.

I studied medicine, nearly three years before my majority, with a country doctor, and learned enough to know that I knew but little about it. I claim the benefit of a little common sense and observation, while the assertion of an erroneous fact often leads to the discovery of the truth.

I will close by saying that when my children had the measles (in early February) they first appeared as the usual red pimples, then these pimples spread irregularly and grew darker, forming irregular blotches and, finally, the entire skin became like the darkest piece of hemlock, tanned sole-leather — in appearance. Afterward, ear-ache and discharge from the ears, deafness and peeling of the skin followed.

I ventured the highly scientific idea that scarlet fever and measles had joined together for the extermination of my loved ones. My doctor said *no*, and I said I did not *know*.

Truly yours,
E. D. NORTHRUP.

FEVERS.

REPORT OF ENTERIC FEVER AT PERRYSBURGH.

ELISHA HARRIS, M. D., *Secretary State Board of Health:*

DEAR SIR — I herewith send you a more detailed history of the cases of enteric fever which are supposed to have originated at the Knowlton homestead.

The farm of Mr. Knowlton is situated about three-fourths of a mile from the village of Perrysburgh, Cattaraugus county, a small station on the Erie railroad.

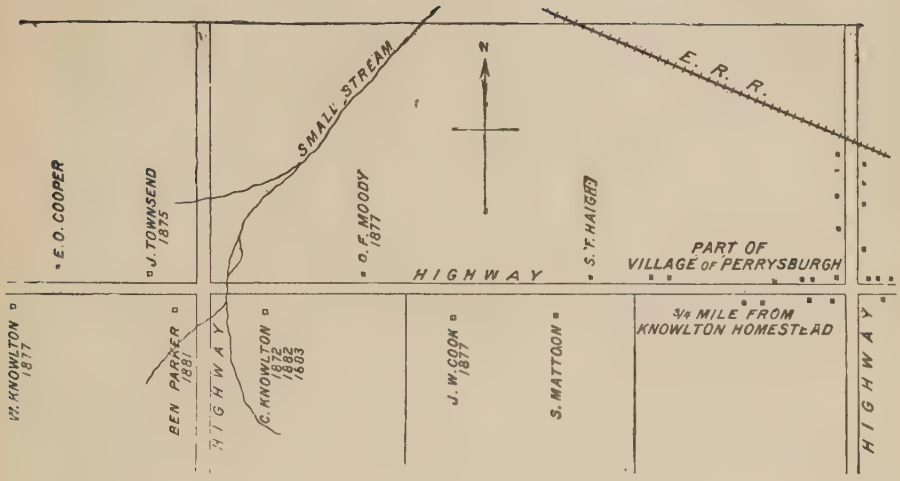
I inclose a map giving the location of the homestead and its situation as regards other families in which typhoid fever has occurred since its appearance in the Knowlton family.

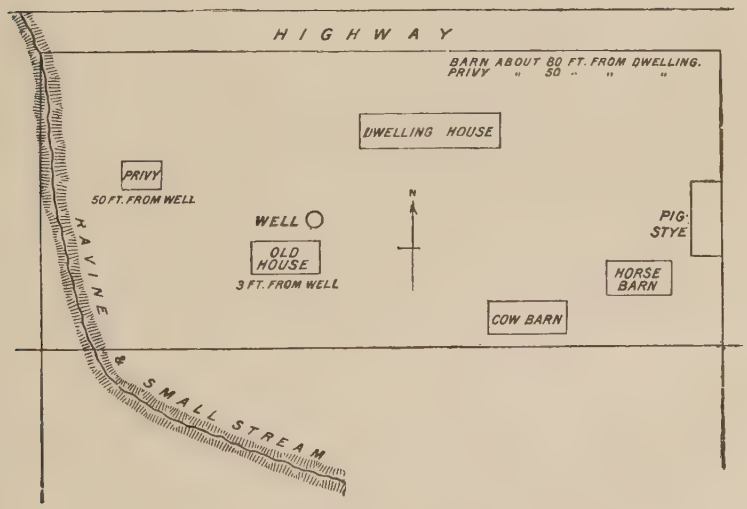
In the autumn of 1872 Mr. Orin Knowlton, his wife and two sons, comprising all of his family at this time, were all sick with enteric fever. Since this time nearly every year the same disease has made its appearance again on the same premises among men, women and children in the employ or living in the family of Mr. Knowlton or in the family of some of his neighbors.

In the instance of those who were taken sick while living in the household of Mr. Knowlton in every case they have been taken to their homes elsewhere and in a number of instances have become the center of an epidemic in the locality in which they were taken.

No cases of fever since the first one (Mr. Knowlton's family); have gone through with a course of the disease or remained during the time on the premises, consequently there has never been a removal of the propagating cause of fever, but there is every reason to believe that these first four cases have left on the homestead the germs of typhoid fever which through some avenue or other inflict all who are not protected by a previous attack of the disease, who remain for any length of time as guests or domestics in the family.

In giving a history of this endemic I shall commence with the more


SMALL STREAM
N
E. R. R.
E. O. COOPER
J. TOWNSEND 1875
O. F. MOODY 1877
S. T. HAIGHT
HIGHWAY
PART OF VILLAGE OF PERRYSBURGH
W. KNOWLTON 1877
BEN PARKER 1881
HIGHWAY
C. KNOWLTON 1872 1882 1883
J. W. COON 1877
S. MATTOON
3/4 MILE FROM KNOWLTON HOMESTEAD
HIGHWAY


HIGHWAY
BARN ABOUT 80 FT. FROM DWELLING.
PRIVY " 50 " " "
DWELLING HOUSE
PRIVY
50 FT. FROM WELL
WELL
N
OLD HOUSE
3 FT. FROM WELL
PIG STYE
HORSE BARN
COW BARN
RAVINE
SMALL STREAM

recent cases and trace back year by year to those next preceding, and in cases where there appears to be any doubt of their connection with the Knowlton homestead I shall so state. A few cases have occurred of which it is impossible to obtain any history. These cases are of persons whose homes are a long distance from the Knowlton homestead and of whom after they are taken sick and gone home no account can be obtained.

The last case of typhoid taken sick at the Knowlton homestead was a Mrs. Chaise who was attacked in August of the present year (1883) while at work as a domestic in the family. A few days after her seizure she was removed to her sister's family, two and a half miles distant, where she was attended by Dr. Zwetts, of Gowanda, from whom I have obtained the following history of her case. Her age was sixty-two years, a widow. In the beginning of the attack she had quite severe headaches with chilly sensations, an afternoon temperature of 103 degrees, increasing after a few days to 104 degrees, tympanitic abdomen with tenderness and gurgling in right illiac region, after ten days rose colored spots on the abdomen. During the second week diarrhœa occurred and at beginning of third week she had intestinal hemorrhage and died of exhaustion a few days after.

About the same time she was taken sick a young man, also at work for the Knowltons, was attacked with fever, and being brought to his home in the village of Perrysburgh, three-quarters of a mile from the Knowlton homestead, recovered after three weeks' sickness.

In the month of September, 1882, a young Swede, by the name of Theodore Samilson, was at work at the Knowlton farm, engaged in reaping grain — he was only on the premises about a week — two weeks afterward, while at work at another place, three miles away, he was attacked with typhoid fever. There was no fever at the latter place, nor, to my knowledge, had there ever been any before, nor has there been any since. He was taken from this place to his brother's residence, three miles from Perrysburgh, where he was sick four weeks, his case presenting all the symptoms of an ordinary attack of enteric fever. While he was convalescent, his brother, who had the care of him during his sickness, was attacked with fever, and, before his recovery, his sister and his brother's son also suffered from the disease. None of these cases were fatal.

In the month of October, same year (1882), a young man by the name of Lossie Rugg, at work for Knowlton, engaged in pressing hay, was taken sick soon after leaving the place, and went through typhoid fever at his father's home, two miles from Perrysburgh; after his recovery his father had typhoid. There had been no typhoid in the locality of these last two cases before nor none since.

In the fall of 1881, Amos Kesler, a lad fourteen years of age, was taken with typhoid while at work for Mr. Knowlton, and living in his family. He was taken home to his father's house, in the village of Perrysburgh, as soon as attacked. He recovered after four or five weeks. The boy's sickness was followed by the sickness of his father, who died after four weeks of undoubted typhoid fever, the immediate cause of his death being intestinal hemorrhage.

In the month of August, 1881, Mrs. William Crandall, whose home was about twenty rods west of the Knowlton homestead, it being the

nearest residence on the west side, had typhoid. Her husband was at this time at work for Mr. Knowlton, and Mrs. Crandall herself was daily at the Knowlton dwelling. All the milk used in her family was obtained from the Knowltons. During her sickness she was removed to her father's house, in rather a remote neighborhood two miles away. After she had been sick four weeks her son George Pelton was attacked, and after him two other brothers and her mother; three of the cases in this group were fatal, viz.: Mrs. Crandall and two of her brothers.

William Pelton, one of the brothers, went from his home to assist in the care of his friends, and, after his attack, came back for care into his wife's father's family, and there conveyed the disease to two of his wife's sisters, Mary and Susie Parker, aged eight and ten years.

In November, this same year (1881), a German girl at work as a domestic in the Knowlton family, was taken with typhoid, and carried to her home in Gowanda, where she conveyed the disease to nine others, three of these cases fatal.

In October, 1877, typhoid fever appeared in the family of David Moody. Mr. Moody's residence is about forty rods east of the Knowlton homestead, on the opposite side of the street. Mrs. Moody and her two sons all suffered from the disease. Mr. Moody himself had previously had fever. Mr. Moody informs me that for some weeks before his family were sick, his well being dry, all the water used in his household for drinking purposes was obtained from the well on the Knowlton premises.

The same year (1877), in November, three children of W. Cook, who lives on the other side of the street from Mr. Moody, and sixty rods east of the Knowlton house, had fever. I am unable to trace any certain connection of these cases with the source of infection at the Knowlton homestead, although one of the boys who was sick, but not the first one attacked, had been at work for Mr. Knowlton, and living in his family for some weeks before his sickness.

During the same month and year, Lovel Horton, while at work for Mr. Knowlton's father-in-law on the farm next adjoining the Knowlton homestead *west*, was attacked with typhoid fever, and before his recovery his wife also contracted the disease.

In the fall of 1874, Mrs. John Townsend, whose home is almost directly opposite the Knowlton homestead, contracted fever and was sick for several weeks.

In the interval between this last case and the time when the Knowlton family themselves were sick, two years, I am not able to give any history of cases, I think there were one or two, who were employees in the family. As stated in the beginning of this letter, in September, 1872, this endemic first made its appearance in the family of Orin Knowlton, himself, his wife and two sons, William and Herbert, were all sick and all recovered, and following their sickness Mr. James Remington, who was employed to nurse them, was attacked and after a prolonged sickness recovered.

In the eleven years covering the time over which this endemic extends there have never been but two cases of typhoid fever other than those herein described, within two miles of the Knowlton homestead, and I am of the opinion that both of these cases may in time be traced to the same source.

Since writing the above another case has occurred in the Knowlton family; a girl aged about twelve years and adopted by the Knowlton's, during the past summer she was attacked with typhoid September 23, and is at this time very ill with the disease. I may say that this and the two other cases which have been taken sick at the Knowlton homestead are the only cases of enteric fever which have occurred anywhere in this locality this season.

Very respectfully,
A. D. LAKE, *Health Officer.*

PERRYSBURGH, N. Y., *August* 30, 1883.

ELISHA HARRIS, M. D., *Secretary State Board of Health:*

DEAR SIR — In pursuance of your request I herewith inclose you a description, together with a chart of the premises of Orin Knowlton, and a history, so far as I have been able to obtain it, of the cases of typhoid fever which for ten years past have annually occurred in the family, or among the employees or neighbors of Mr. Knowlton.

The danger of infection at this place has become so noted that it is a common remark throughout the neighborhood, that no one who has not previously had the disease can reside in Mr. Knowlton's family without contracting typhoid fever. On careful inquiry I find this to be true in nearly every instance. All the servants who have lived in the family for the past eight years have contracted the disease, and if they have gone to their homes have conveyed the fever to others, in some instances becoming the center of quite an extensive epidemic.

The premises in question are situated in the town of Perrysburgh, Cattaraugus county, three-quarters of a mile from the village of Perrysburgh, a station on the Erie railroad, the farm is on elevated ground as in fact is the whole country, the village being about 600 feet elevation above Lake Erie; twelve miles distant the farm is above the village.

The house is at the lowest part of the farm, the out-buildings and well being above the house, the spring is below the well and fifty feet from it. The drainage from the house is fair and does not flow toward the well. The cellar is damp, but at no time contains any large amount of water.

I represent by the annexed chart the situation of the various buildings on the farm.

The barns are about eighty feet from the dwelling, the privy fifty feet.

Before proceeding with the history of the cases which are supposed to have had their origin on the above described premises, I may say that, although there are many cases of typhoid throughout this part of the county, there have been none in the near vicinity of Perrysburgh for several years past, except those which can be clearly traced to the source described.

The first cases were the whole of the family of Knowltons, consisting of himself, wife, and son, and a man employed as nurse was attacked after returning home; this, I think, was in the year 1875. During the following autumn a family living near the Knowlton place, their nearest neighbors, had typhoid; there were three cases. The head of the family informs me that for several weeks before his family

were taken sick their water for drinking purposes was all obtained from the well on the Knowlton place.

About a year from this time a young man living near Knowltons, and who is said to have worked and boarded there, was taken with typhoid; his brother and sister were sick with the same disease after his recovery.

The next year a young woman living a few rods west of Knowltons (the other cases were on the east side of the farm) was sick with typhoid, her husband was in the employ of Mr. Knowlton and she was a frequent visitor at the house. She was moved away, to be taken care of by her friends at a distance. She conveyed the disease to four others, making five cases, three of which were fatal.

There were several cases up to the fall of 1881 of which I can obtain no certain history. In 1881 a German girl employed by Mr. Knowlton was taken sick in his family. She was carried home to Gowanda where her sickness was followed by nine cases in her father's family, three of which were fatal.

In November, 1882, a young Swede was taken sick while at work for, and living in the family of, Mr. Knowlton, and went for care and treatment to his brother's residence; his brother, sister and brother's son were all attacked with typhoid.

This present year, in August, a young man and an elderly woman who have been at work for Knowlton, and living in his family, have both had fever, the young man is recovering, the other case was fatal.

Very respectfully,

A. D. LAKE, M. D.,
Health Officer.

Before proceeding with the history of the cases, which are supposed to have had their origin on the above described premises, I may say that our locality furnishes many cases of typhoid fever other than those spoken of. Aside from this one disease, I will venture to say that there is not a more heathful region in the State.

List of names of cases of enteric fever in the town of Perrysburgh, N. Y., in the family of Orin Knowlton, and the families of his neighbors, and others, to whom they have communicated the disease:

1872, Orin Knowlton, age 56; Lydia Knowlton, age 50; William Knowlton, age 22; Herbert Knowlton, age 18. Owner and resident of Knowlton homestead, and first cases occurring in the endemics; source unknown.

1875, Mrs. I. Townsend, age 45. Lives opposite the Knowltons.

1877, Mrs. Daniel Moody, age 36; Beiden Moody, age 10; Elbert Moody, age 8. Residence, twenty rods east of Knowltons. Used drinking water from Knowlton well six weeks before attack.

1877, Lovel Horton, age 34; Mrs. L. Horton, age 30. Residence, twenty-five rods west of Knowlton, and at work on adjoining farm.

1877, Albert Cook, age 12; Susie Cook, age 15; Eddie Cook, age 8. At work for Knowlton before attacked; living thirty rods west of Knowltons.

1881, Mrs. William Crandall, age 21. Residence ten rods east of Knowltons.

1881, William Pelton, age 21; Mrs. C. Pelton, age 55; Geo. Pelton, age 16; Edwin Pelton, age 18. Relatives of last case evidently contracted disease from her.

1881, Mary Parker, age 11; Martha Parker, age 8; Edwin Parker, age 56. Members of family where William Pelton was taken care of when sick.

1881, Amos Kester, age 14. Attacked while at work for Knowlton.

1881, Allen Kester, age 38. Father of above.

1882, a German girl, age 18. At work in Knowlton family.

1882, nine cases at Gowanda. In the family, or neighbors of the family, where German girl was taken when removed from Knowltons.

1882, Theodore Samilson, age 24. Attacked after working at Knowltons.

1882, Charles Samilson, age 36, brother of Theodore; Mary Samilson, age 22, sister of Theodore; James Samilson, age 3, son of Charles. Attacked while Theodore was sick, same place.

1882, Lossie Rugg, age 18. Attacked after working for Knowlton.

1882, Major Rugg, age 45. Father of above; took care of him.

1883, —— Smith, age 16. Attacked while at work on adjoining farm.

1883, John Hyson, age 25. Attacked while at work for Knowlton.

1883, Mrs. Chaise, age 60. Attacked while at work for Knowlton.

1883, a German girl, age 12. Living with Knowlton

PERRYSBURGH, CATT. CO., N. Y., *September* 5, 1883.

ELISHA HARRIS, M. D., *Secretary State Board of Health:*

DEAR DOCTOR — In answer to your request that I should give you a more detailed history of cases occurring in the annual endemic of typhoid, which has its origin at the Knowlton homestead, permit me to say that I shall be glad to do so to the best of my knowledge of the individual cases, and will give the matter all the time I can spare from a busy practice.

Several of the persons who have been taken sick in the Knowlton family, while at work there, have, after their seizure, been taken home, in some instances at a distance, and have gone under the care of other physicians than myself. So far as possible, I will obtain the history of these cases from the attending physicians.

Many years have elapsed since the first appearance of the disease in the family, and it may not be possible to get a very reliable description of the first cases. Of the latter ones I think I shall be able to furnish all needed information.

Since I wrote you I have made a list of forty-two cases, which I am satisfied have originated from the Knowlton premises.

I shall be very much pleased to have Dr. Wey visit us at any time. If he will come soon, I will avail myself of his assistance in the arrangement of a plan for beginning the work desired.

Very respectfully yours,

A. D. LAKE.

PERRYSBURGH, CATT CO., N. Y., *September* 26, 1883.

ELISHA HARRIS, M. D., *Secretary State Board of Health :*

DEAR SIR — I inclose you a more complete history of our endemic of enteric fever. I feel that it is very incomplete, and but poorly conveys the facts.

If you will indicate in what respect you wish further details, I will do the best I can to furnish them.

You will see by the report that there is another case in the Knowlton family now sick. I regard that as very significant, as there are no other cases anywhere in the locality.

Very respectfully,
A. D. LAKE.

LAKE, WASHINGTON COUNTY, N. Y., *July* 5, 1883.

Dr. ELISHA HARRIS:

SIR — This neighborhood has been visited for the past five or six years with malaria fever and it has extended over a section of country three by five miles.

The cause I believe to arise from the Cossayuna lake (which is about eight miles west from Salem). The mill-owners at the foot of the lake holding the water back in the lake until warm weather and then drawing it down and leaving the marshes bare. At least this has been done about the same length of time the fever has been prevalent here.

For reference I would refer to Dr. Irwin, of West Hebron, whose practice extends over the section of country mentioned.

I send this to you hoping that you can take some steps to give us some relief, or to give us some information that will enable us to find it from other sources.

Three of my family have been suffering from it this summer and another is beginning to complain from the same cause, I am afraid.

One of my neighbors and myself were thinking of coming down to see you but have hardly time at present.

Hoping to hear from you soon, I remain,

Yours, etc.,
DONALD REID.

ARGYLE, N. Y.,
OFFICE OF THE TOWN BOARD OF HEALTH,
August 14, 1883.

Dr. ELISHA HARRIS, *Sec. State Board of Health :*

DEAR DOCTOR — The Argyle town board of health has before it an interesting and what may prove to be a very important case. Situated in the eastern part of the town is a sheet of water some three miles in length by about one mile in width, called Cossayuna lake; there is considerable marshy ground on the borders; during the past two years malaria has developed itself to a large extent; it is not confined to the immediate vicinity of the marshy district, but seems to include not only that but the entire watershed of the lake,

taking in the inhabitants on the hills. At the foot of the lake is a dam which sets the water back which is used for manufacturing purposes, as wanted. This dam is in the town of Greenwich. It is alleged that within six years the lake has been gradually raised by the owners until now it is two feet higher than for a long term of years previous. Last week a complaint was made to the board of health, with a request that the matter be investigated. On Monday, August 13, 1883, a meeting was called, a full board being present, the statements of the complainants being heard, and also that of Dr. S. B. Irwin, a physician residing in West Hebron, but practicing in the infected district. A resolution was passed appointing a committee of three, the health officer being one of the said committee, to investigate the matter and report at a subsequent meeting. It was also resolved that the committee seek the advice of the State Board of Health, and to this end the committee has instructed me to request that an agent or member of the State Board be sent to the aforesaid locality to co-operate with the committee on the part of the town board in an effort to ascertain and arrive at the true condition of affairs, as far as possible so to do. Will you have the kindness to comply with the above request, giving me two or three days' notice, that I may forward the same to our committee, so that all may be ready and appear on the appointed time. The gentlemen can take the morning train from Albany to Fort Edward and stage to Argyle, where a conveyance will be in readiness to go to the lake. Arrangements will be made to allow the gentlemen to return as soon as possible.

Very truly yours,

H. A. McEACHRON,

Sec. Town Board of Health, Argyle, N. Y.

GREENWICH, N. Y., *September* 21, 1883.

ELISHA HARRIS, M. D.:

DEAR DOCTOR — I herewith send you the tabulated result of my personal examination into the extent of malarial fever prevailing at Lakeville, and in the valley of Lake Cossayuna, swamp and Carter's lake, made September 10, 1883. I had to do the work at such a time as my business would permit, hence did not delay until September 20; I presume it will make no material difference.

Nearly all the cases found were located between the outlet of Lake Cossayuna, and the point where the outlet of the Alexander Bros'. ponds crosses the road near the residence of Wm. Alexander; I account for this fact by the class of people who reside in the above-mentioned locality being of a poor and less cleanly kind, and that their water-supply being not as good as that south of the ponds.

I believe some few of the reported cases were not malarial as they made their own diagnoses and took their own treatment or none.

Any other information that you may desire from me regarding the above I shall be pleased to furnish.

We are having some malarial fever at Middle Falls, two miles below

Greenwich, are the kill. Malaria prevails about this section more than usual this season and may be found upon the highest hills as well as along water-courses.

Are the published reports of the National and State Board of Health for general distribution ? If so, I should be pleased to possess them.

Very truly yours,

G. H. WHITCOMB.

MIASMATIC FEVER REPORTS FROM DR. WHITCOMB, HEALTH OFFICER, GREENWICH.

Houses in which fever occurred.	Number of inmates in each house.	Number of fever cases in each house.	Ages.	Sex.	Kind of fever in each case.	Year when fever first occurred.	Number of cases before present year.
1	3	1	60	M.	Ague.	1882	1
2	2	1	70	M.	Ague.	1882	1
3	2	2	56, 70	F.	Ague.	1883	
4	9	2	16, 50	M., F.	Ague.	1882	2
5	3	2	40, 38	M., F.	Ague.	1883	
6	4	2	60, 41	F., M.	Ague.	1881	1
7	7	5	13, 12, 33, 18, 15	3 F., 2 M.	Remit.	1883	
8	6	4	52, 13, 8, 14	F., 3 M.	Ague.	1883	
9	3	1	39	F.	Ague.	1883	
10	4	2	38, 4	F.	Ague.	1882	2
11	6	3	10, 8, 5	M., 2 F.	Remit.	1882	5
12	4	2	25, 21	M., F.	Remit.	1883	
13	3	1	40	F.	Ague.	1883	
14	2	1	65	M.	Ague.	1883	
15	6	1	35	F.	Ague.	1883	
16	2	1	21	F.	Ague.	1883	
*17	6	5	50, 13, 50, 5, 7	3 M., 2 F.	Ague.	1883	
18	3	1	12	F.	Ague.	1883	
†19	5	1	40	M.	Ague.	1882	1

The whole number of householders in the above region was forty-four.

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* Lately moved from east side of lake. † The only one south of village along swamp.

REMARKS. — This report includes householders within the watershed of Lake Cossayuna and Carter's lake, where cases of miasmatic fever occurred between June 1 and September 20, 1883.

1. Total number of householders within the watershed of Lake Cossayuna, that report miasmatic fever between June 1 and Sept. 20, 1883.	2. Total number of inmates in houses, that so report between June 1 and Sept. 20, 1883.	3. Total number of fever cases in such houses.	4. Total number of cases under care of physician Sept. 10, 1883.	5. Age.	6. Sex.	7. Kind of fever in each case.	8. The year when fever first occurred.	9. Number of cases before present year.	Remarks.
Number 1.....	3	1		60	M.	Ague.....	1882	1	
2.....	2	1		70	M.	Ague.....	1882	1	
3.....	2	2		56, 70	F. F..	Ague.....	1883	.....	
4.....	9	2		16, 50	M. F. .	Ague.....	1882	2	
5.....	3	2		60, 41	M. F.	Ague.....	1883	.....	
6.....	4	2		40, 38	F. M.	....	1881	1	
7.....	7	5		33, 18, 15	F. M. F.	4 Ague...	1883	.....	
				13, 12	F. M.	1 Remit..			
8.....	6	4		13, 8	F. M.	Ague	1883	.....	
				14, 52	M. M.				
9.....	3	1		39	F.	Ague..	1883	.....	
10.....	4	2		38, 4	F. F.	Ague..	1882	2	
11.....	6	3		10, 8, 5	F. F. M.	2 Ague. 1 Remit	1882	5	
12.....	4	2		25, 21	M. F.	2 Remit....	1883	.....	
13.....	3	1		40	F.	Ague.	1883	.....	
14.....	2	1		65	M.	Ague.....	1883	.....	
15.....	6	1		35	F.	Ague.	1883	.....	
16.....	2	1		21	F.	Ague	1883	.....	
17.....	6	5		50, 5, 7	3 M.	Ague.....	1883	.....	Lately removed from east side of lake.
				50, 13	2 F.				
18.....	3	1		12	F.	Ague.....	1883	.....	
19.....	5	1		40	M.	Ague..	1882	1	This was the only one found below or south of the village along swamp and Carter's lake.

None sick or under doctor's care Sept. 10.

The whole number of householders within the watershed of Lake Cossayuna's swamp and Carter's lake, that reported no miasmatic fevers, was forty-four. The list of families reporting fevers were from the same locations.

WEST HEBRON, N. Y., *September* 28, 1883.

Dr. HARRIS:

DEAR SIR—I have treated fever ague in twelve families since the first of June. Twelve of my patients have been males and nine females. In ten families only one member was attacked, in one seven and in one four. The ages I cannot give with exactness, hence an approximation. Six were under ten; two between ten and twenty; one between twenty and thirty; three between thirty and forty; four between forty and fifty; two between fifty and sixty; one between sixty and seventy, and two between seventy and eighty. With one exception the cases were all tertians and it was a quotidium.

There are some additional facts connected with the history of malaria about Cossayuna lake that I think you ought to know and I will write them out so that you can have a clear conception of what is the cause of the trouble about the lake. I will send them by next mail.

Yours respectfully,
S. B. IRWIN.

WEST HEBRON, N. Y., *Nov.* 11, 1883.

Agreeably to the promise made in my letter of the 30th of September, I write to give some additional facts in regard to the malarial fever that is prevailing around Cossayuna lake. I would have written before, but have so disliked to have any thing to do with this matter that I have delayed till the present. But before entering upon this I will notice the general malarial condition which I believe has always existed here. All this region, after its first settlement, was very decidedly malarious, as fever ague and bilious remittent fever prevailed very generally; but with the clearing up of the country, the cultivation of the soil, and the consequent improved drainage, these fevers gradually disappeared; still, I think it can be safely said there never has been a time when they have not been occasionally met with in practice. This certainly is in accordance with my own experience, as I have, all along through my professional life, met cases of malarial fever. Of course I do not refer to such as were, or could have been, imported, but to those that must have had their origin here. I know the question of the correctness of my diagnosis may be raised, but I feel assured that the cases of fever ague were too plain to admit of doubt. I know of a certainty that they presented all the phenomena of this disease and yielded immediately to its appropriate treatment. I have consulted some of the older physicians who have long practiced in this vicinity and they said that my experience coincided with their own.

In the autumn of 1880 I had four cases of fever ague at the lake, and by their situation they formed a belt around its south-western border. The two first persons attacked lived opposite the dam of the upper or western pond, the third opposite the outlet of the lake, and the fourth about half a mile up its western side. The situation of these cases may be regarded as indicating the malarial region for that season. There is a peculiar circumstance connected with the section

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thus mapped out that I will notice in this connection. In it the malarial poison, during all its recent history at the lake, seems to have been the most virulent, as it has here and here only, with perhaps a single exception, affected whole families, and has generally affected those living at a considerable distance from the shore. I will attempt an explanation of this.

In the early morning a current of air has been observed to move in a south and south-westerly direction through the valley in which the lake is situated. This has long been observed by those living about the lake. Those living about its southern extremity speak of "feeling" the damp morning fogs passing over them, while on the other hand the inhabitants of the northern shore say they seldom get the lake fogs, as they generally move south, and especially to the south-west. Now it was in the track of this morning current, carrying, as it does, the vapors that arise from the lake and its surrounding marshes, that the first cases of fever ague occurred, and in it the disease still is more general and severe than elsewhere. Those living upon the northern and eastern shore have suffered comparatively little, and the reason for this is obvious; the morning current, already mentioned, carries the poisonous germs away from them. The fact of the general prevalence of this current is well established, and its causes, which, of course, are purely physical, can be easily understood, but I will not discuss them.

The dam of the upper pond, before it was repaired by the present mill-owners, was a very imperfect structure, and the water flowed "through it" so freely that usually the lake was so low by the first of June that the upper mill could no longer be used. The marshes and low-lying lands were thus emptied and dried before the high temperature that is necessary for the abundant production of malaria came, and were soon covered with a living vegetation, which was a favorable condition. Now the marshes and low-lying lands are flooded with water at the commencement of the heated term, and as the lake is rapidly lowered, both by evaporation and by the waters being drawn off to run the mills, they are thus emptied and exposed to a July and August heat, with the vegetation of the previous autumn rotting upon their bare surfaces. The result is what might naturally be expected — the abundant production of malaria.

Under the old order of things after the first of June the outlet was only an inconsiderable stream; hence during the extremely hot weather evaporation was the only active cause of waste, and as a consequence the least possible extent of bare, wet surface was exposed to be rapidly dried at a midsummer temperature. We always had, and we still have, a bare shore line, but now this occurs a little later in the season than formerly. As the wet shore line is constantly laved by the fresh waters of the lake there is no stagnant water as there must necessarily be when a marsh covered with bogs, brush and debris of almost every kind is dried up during the heated term. The evil of the bare shore is unavoidable, and it probably always caused the production of some malaria, but not in sufficient amount to cause malarial fever, unless the exposure was very peculiar and decided. The history of malarial fevers about the lake in the past would seem to indicate this, for, with the presence of this evil, they gradually lessened in frequency of occurrence until they were rarely met with.

I know of no cases of fever ague having occurred about the middle pond till last year. It was four years ago that it was dried up, and, as the fever ague had been prevailing for two years before around the south-western shore of the lake, it is not probable that the pond was the source of the poison. If it was it is strange that none of the persons first attacked lived upon its shore. The little hamlet almost surrounds it, but no cases occurred in its immediate vicinity until two years after the disease had been prevailing around the south-western border of the lake.

There are about a dozen dwellings containing between thirty and forty inhabitants situated around the great marsh south of the village, but, with a single exception, they have not had any cases of malarial fever during the last twenty years. In view of this we can scarcely think it has any thing to do with the malarial fever that is prevailing around Cossayuna lake. This great marsh is flooded every spring, but the water is allowed to flow out of it, and it is dried before the commencement of the very hot weather, and early in the season is covered with a living vegetation. The water was once dammed back in it, as it now is in Cossayuna lake, and malarial fever of a terribly severe type raged all around it. The matter was taken into the courts, and the proprietor was compelled to take down his dam, and the malarial fever soon disappeared. The holding of the water in the marshes of Cossayuna lake is exactly parallel to this and with like results.

In 1880 three of the cases were at a level not exceeding ten feet above the water of the lake; the fourth was at an elevation of about fifty feet. In 1881 I had eight cases. They were all situated on the belt around the south-western border of the lake already referred to. An elevation of about three hundred feet was reached and one case occurred nearly a mile from the shore. It was in the track of the lake fogs already described. In 1882 the malarial region extended around the foot of the lake through Lakeville, and the present year it has reached the head of the lake, every family living upon the road that runs along its western shore having suffered more or less, with but one exception. The greatest elevation reached has not exceeded that of 1881. Nearly all the families in Lakeville living north of the ponds, hence nearest to the lake, have had the disease. I only know of two that escaped, and the members of these were old people who were little exposed to the damp morning and evening air.

This letter is already very lengthy, but I have felt that it was necessary to present the facts to you, and I have done so as briefly as I could. Evidence that the water is held back in the lake in the spring and early summer will be furnished if desired.

I was brought up upon the shore of this lake, and have been riding around it almost constantly for the last nineteen years; hence I think I can say, without being egotistical, that I am familiar with this whole matter. I treated the first cases, and have carefully observed the development of the malarial disease, and feel sure that the poison was first developed in the marshes of the lake, caused by their being kept flooded with water till the hot summer weather, and then by their being dried up at a high temperature.

Truly yours,

S. B. IRWIN.

Report on the Occurrence of Malarial Fever at Lakeville, Washington Co., N. Y.

Albany, *November* 22, 1883.

To the State Board of Health :

After a thorough examination of the ground in question by two members of the committee at different times, Dr. Elisha Harris, in August, and Mr. Gardiner, the chairman of the committee, on the 20th of November, the committee report as follows :

The hamlet of Lakeville is situated at the southern foot of Lake Cossayuna, or rather along the outlet of that lake, occupying both banks of the outlet for a distance of about one-third of a mile below the south end of the lake.

Lake Cossayuna is a beautiful sheet of water about one-third to one-half mile broad, and some three miles in length, lying in a basin among the hills. The lake itself is about 600 feet above the sea, while the hills about it rise over a thousand feet above the sea-level, some eight or nine square miles of surface drain into the lake. The slopes, both on the eastern and western sides, come down quite steeply except at the immediate shores. The longer axis of the lake basin lies nearly north and south. Two streams of small size enter the lake; one, a brook at the northern end, running about two and one-half miles, and another brook coming from Gifford's or Summit pond and entering the lake near its south-western corner, about one-fourth of a mile north-west of where the outlet leaves the lake. The brook which leaves Lake Cossayuna at its southern end and forms the outlet of that lake has not a large channel, certainly not large enough to discharge the heavy rain-falls occurring in the wet season in the early part of the year when the ground is saturated. This outlet has a fall in the first one-third of a mile of nearly thirty feet; here it enters another basin which is almost flat for one and one-half miles down the course of the outlet, which is nearly south.

This *flatland* is a swamp deeply filled with muck over most of its area. The lower part is occupied by a small pond called, on the county map, MacNab's pond. The width of this swamp basin is little less than a mile. It seems to have been originally a shallow pond or lake setting back to within a quarter of a mile in a direct line of Lake Cossayuna. Washings from the neighboring hills and a rank growth of vegetation fill this ancient lake until it has become a nearly level swamp,— a mile broad by nearly one and one-half miles long.

Lakeville stands immediately at the north end of this great swamp on a narrow isthmus of hard land which separates the large swamp from the swampy lands at the south end of Lake Cossayuna.

The fall of the outlet from Lake Cossayuna has been utilized for manufacturing purposes by placing three dams across it. The upper one is not far below the lake and it is this upper dam which has the power to raise the waters of Lake Cossayuna several feet above its natural level. At this dam there stands a saw-mill. Below the dam comes the first mill-pond, and below that is a second mill-pond. It is the habit of the owners of the mills, in times when water is scarce, to fill these mill-ponds during the night and draw them down during the

day. The bottom of the upper mill-pond is exposed for from ten to fifty feet out from the shores when the water is drawn down. The bottom is somewhat muddy and covered with a thin layer of sawdust from the saw-mill above, and also a thin coating of green vegetation. On the bottom of the second mill-pond there is also some vegetation and a little sawdust.

The houses of the village stand directly above these ponds on the hill slopes and most of them within 200 or 300 feet of the shores.

Along the road bordering the western shore of the great swamp below Lakeville, there are three houses that are occupied. The most southern of these houses is nearly a mile below the village and stands within a hundred feet of the shores of the swamp. The inhabitants of this dwelling are subject to fever and ague. The first house at the southern end of Lakeville stands immediately above the northern end of the swamp and perhaps twenty-five feet above it on a gravelly terrace. It is much nearer to the swamp than to the lower mill-pond. The inhabitants of this locality are subject to fever and ague.

According to a map submitted to the board, there do not appear to be as many cases of fever and ague at this southern end of the village as at the northern end where the houses stand on the eastern side of the outlet and immediately east of the first pond, the bottom of which is covered with both saw-dust and vegetation. The southern end of Lake Cossayuna on both sides of the outlet has also swamp-margins. The largest body of these swamp lands lies on the western side between the stream coming from Summit pond and the outlet. There is here a body of flat muck land which has evidently existed for a very long time as swamp. It is perfectly clear that these swamps lying at the end of Lake Cossayuna were in existence or were subject to natural overflow before the building of the dams in the outlet. It is also evident that they are liable to be saturated by water whenever the lake is raised above its natural level and again dried out when the lake is lower.

The people living on these swamp areas, at the southern end of the lake, are subject to malarial fever.

Malarial fever has also appeared at the house of Mr. Donald Reid, about one-third of a mile from Lake Cossayuna, up the Summit pond brook at a height of one hundred feet above the lake. No other cases of fever were reported in this direction. An examination of the premises of Mr. Reid showed that his house stands upon rock covered with a comparatively thin layer of clay, and that while the roads and ground a short distance away from the house were dry and dusty the clay around this dwelling was saturated with water. This water comes from a spring north of the house. The water is brought from the spring to the barn yard, through a pipe, and empties into an open trough, the overflow of which saturates the surrounding ground. The surface of the ground here is twelve feet higher than that about the dwelling. The upper stratum is a loose soil some two feet deep, through this the water percolates until it reaches the clay over the rock along which it readily finds its way down the steep slope to the house and saturates the clay about the dwelling. Water is also brought directly from the spring to the house and empties into a trough on the east side of the dwelling. The overflow of this trough

is allowed to saturate the ground within ten feet of the eastern wall of the house. From these facts it appears that saturation of the soil about this dwelling, for which the owner is entirely responsible, is a sufficient cause for malarial fever in a region bordering upon such extensive swamps.

We have learned that malarial fever has occurred and perhaps prevailed in this region in past times before any dams were built, that is to say, near the south end of Cossayuna lake and on the Battenkill in which the stream from Lake Cossayuna empties.

It has not been possible to get the exact record of this matter, but there is medical testimony, and testimony of some of the older inhabitants, tending to show that malarial fever has existed along the Battenkill for more than one hundred years. Whether the disease has ever before come up to the shores of Lake Cossayuna is not certain. For the past two years malaria has prevailed between the south end of Lake Cossayuna and the swamp south of it to a very serious degree. At one time during the past summer cases were reported in nineteen out of forty-four dwellings. Persons living about the northern half of the lake do not appear to have suffered; most of the cases were, as we have said, in Lakeville immediately about the mill pond and the north end of the swamp and in the houses on the shores near the south end of Lake Cossayuna and overlooking the swamp tracts near the outlet.

Only three dwellings not immediately upon the shores of the lake were known to the committee as having been troubled with malaria; one of these, distant one-third of a mile from the lake and one hundred feet above it, is shown to have local conditions about the dwelling calculated to produce fever in a malarial region; the other two cases of fever not immediately upon the lake or the swamp were not examined.

No case of fever is known in any dwelling situated more than one-third of a mile from swamp-lands bordering the lake. Mr. Reid's house is believed to be further from the lake shores than any other dwelling where fever has occurred, and here we find saturated soil about the house and a water-course leading directly down to the largest area of muck-land that lies at the south end of Lake Cossayuna. There are several other dwellings near Mr. Reid's, but further removed from the brook, in which no cases of malaria developed.

A mile west of Lake Cossayuna, at an elevation of about nine hundred feet above the sea, is Summit lake and a large swamp adjacent to it, but no cases of malarial fever are reported in its neighborhood.

Very little malarial fever is reported at Argyle, five miles west of Lake Cossayuna and four hundred feet above the sea. The disease appears to prevail only in the immediate neighborhood of the swamp-lands about the south end of the lake along the mill-ponds on its outlet, and on the borders of the swamp south of Lakeville.

From the facts observed, your committee are convinced that the malarial fever prevalent in and about Lakeville is due to the existence of the extensive swamps south of the village, to the borders of the mill-ponds — when they are alternately wet and dried in hot weather — and to the swamps along the shores at the south end of Lake Cossayuna, the fluctuation of the water-level in the mill-ponds and in the lake during the hot weather, causing the swamp shores of the lake and

the borders of the mill-ponds to be saturated with water, and then when the water is drawn off exposed to the hot sun, doubtless tends to aggravate conditions which were already bad enough on account of the swamp tracts before any dams were built.

The only remedy that can be suggested is that of thorough and complete drainage of the swamps, which would doubtless remove much of the difficulty. Whether it would effect a complete cure if the mill-ponds and lake were alternately raised and lowered in the hot weather, as they are now, it is impossible to say. Certainly the beginning of any improvement to the health of this region must be found in thorough drainage of the great swamp lying south of Lakeville, and in reclaiming the swamp-lands along the southern end of Lake Cossayuna. It is possible that these might be diked with low dikes and made into fair agricultural lands. Until these swamp-tracts, that lie to the north and south of Lakeville, are reclaimed and thoroughly drained, it does not appear probable that Lakeville can be healthy. The draining of these lands is, however, a costly undertaking; but it is quite possible that the value of the lands reclaimed would fully repay the outlay.

While these natural swamps are sufficient in themselves to cause malarial fever, it is to be said that the raising and lowering of the water by the dams in the mill-ponds and in the lake probably aggravates the disease, and it should be the care of the mill-owners to avoid, so far as possible, drawing down the water during the hot season.

Since the work of making the region about Lakeville healthful is one which must depend entirely upon the enterprise of the people in carrying out works of drainage and reclamation of the swamp-lands, we respectfully recommend that if this report is approved and adopted by the board, copies of it should be sent to the boards of health of Argyle and Greenwich, and to the leading citizens of Lakeville who have taken an active interest in questions relating to the sanitary conditions of the people.

Respectfully submitted,

JAMES T. GARDINER, *Chairman*,
ELISHA HARRIS, *Secretary*.

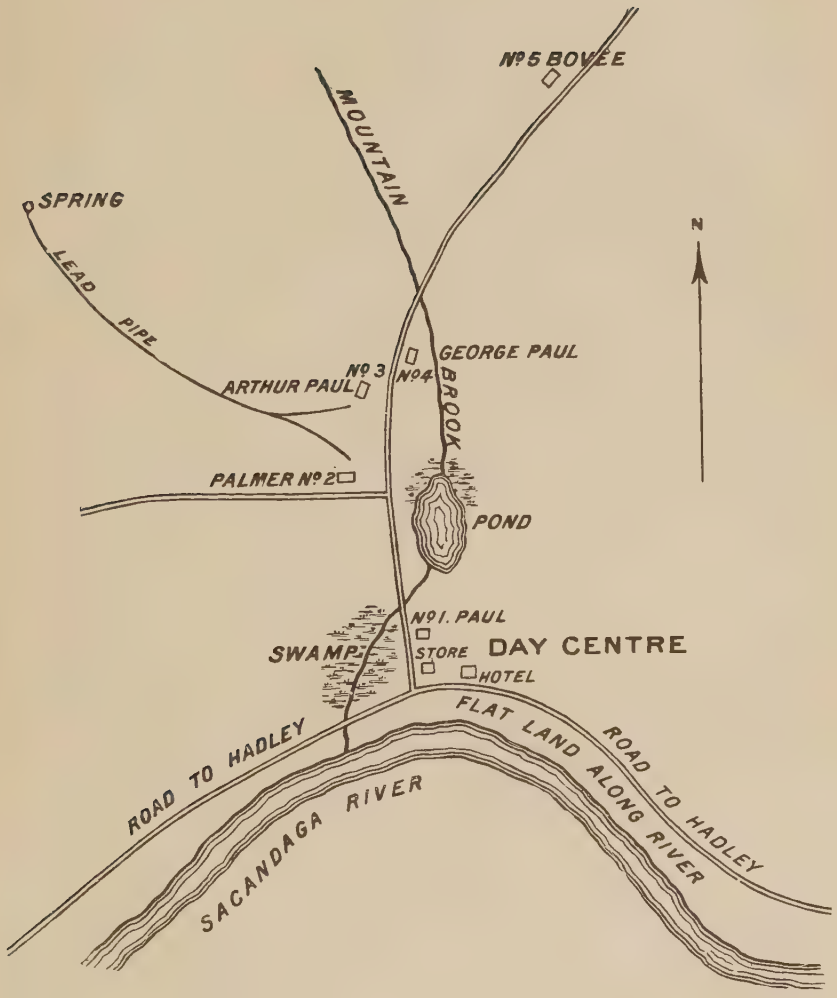
At a meeting of the Board this day it was ordered that the foregoing report of its standing committee on drainage and topography is approved, adopted and that copies be given to the local authorities and citizens as advised by the committee, and also to the press.

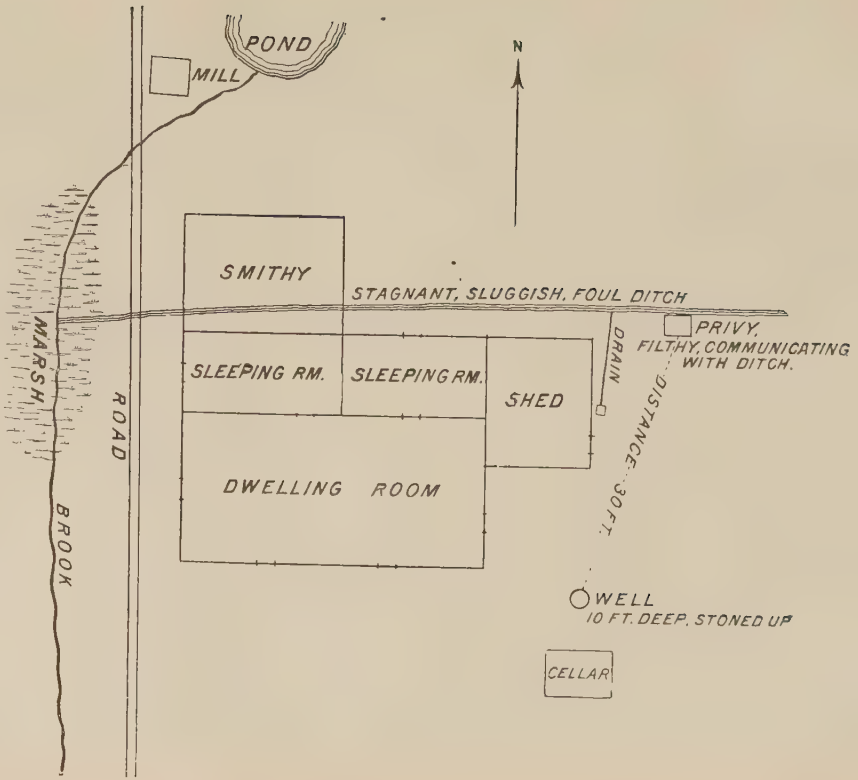
Enteric Fever at Day, Saratoga Co.

Gloversville, N. Y., *Nov.* 15, 1883.

To Elisha Harris, M. D., *Sec. State Board of Health, Albany, N. Y.:*

Dear Sir — I have the honor to report that, in accordance with your request, in association with Dr. J. S. Cooley, of Luzerne, on the first and second insts. I made an investigation of the epidemic of fever which occurred in the town of Day, in Saratoga county, in 1882.


No 5 BOVEE
MOUNTAIN
SPRING
LEAD PIPE
N
No 3
No 4
GEORGE PAUL
ARTHUR PAUL
BROOK
PALMER No 2
POND
No 1. PAUL
SWAMP
STORE
DAY CENTRE
HOTEL
FLAT LAND ALONG RIVER
ROAD TO HADLEY
ROAD TO HADLEY
SACANDAGA RIVER


POND
MILL
N
SMITHY
STAGNANT, SLUGGISH, FOUL DITCH
PRIVY,
FILTHY, COMMUNICATING
WITH DITCH.
MARSH
ROAD
SLEEPING RM.
SLEEPING RM.
SHED
DRAIN
DISTANCE 30 FT.
DWELLING ROOM
BROOK
WELL
10 FT. DEEP, STONED UP
CELLAR

In all there were sixteen cases of fever, with two deaths. There appears to have been three distinct groups of cases. The first group occurred in the immediate vicinity of Day Center. the second about two miles north of Day Center, and the third at Conklingville, which is five miles down the Sacandaga river and east from Day Center, on the border of the town of Hadley. The first group covered the time from the latter part of March to September. The second and third groups occurred at about the same time, viz. : in August and September, but as to locality were separated by about seven miles of distance. The fever was probably enteric, two of the cases having had intestinal hemorrhage, but some of the cases were slight.

The district in which the first and second groups occurred is sparsely settled, quite hilly and from twenty to two hundred feet above the level of the Sacandaga river. The third group occurred in the village of Conklingville, on the bank of the Sacandaga. The soil throughout the region is sand and gravel. With two exceptions the dwelling and surroundings were found in fairly good sanitary condition, and with two exceptions, which were found in the first group, the drinking water used by families of the first and second groups was from wells. In the third group the water used for drinking was wholly from a spring and brought in wooden pipes.

The first case occurred in the person of a Miss Palmer, who was doing house-work for Mrs. Paul, who resided in house No. 1, in accompanying rough sketch. She was taken sick late in March or early in April, and was removed to her father's house ; No. 2 of sketch. Mrs. Carrie Paul, residing in house No. 1, was taken sick early in April. The surroundings of this house No. 1 are exceedingly unsanitary, as may be seen by reference to the imperfect drawing. It is of wood, low, on saturated ground and almost surrounded by unhealthy conditions. On the north side, directly under the window of sleeping-room is a sluggish ditch. The kitchen drain discharges into this ditch at the north-east corner of the house; this drain is of boards, and scarcely covered. A few feet to the east of the mouth of this drain is an exceedingly filthy privy, which stands on the bank of the ditch, so that its contents may run into the water. At a distance of thirty feet from the drain and privy is the well ten feet deep and stoned up. Water from this well was used for drinking purposes. There is no cellar under the house, but an outside cellar a few feet south from the well. We have here sufficient necessary conditions for the development of zymotic disease. Previous to illness of Mrs. Paul a child had been ill slightly of some disease, the nature of which was not ascertained.

As before stated, a Miss Palmer, who was doing house work for Mrs. Paul, was taken sick here, and removed to her home a quarter of a mile distant, on higher ground, and on west side of pond. Here six other members of the Palmer family were successively sick during the spring and summer, and two died. The surroundings of this house were healthy. Spring water brought in lead pipe at least a quarter of a mile was used. But discharges from the bowels were deposited in the open privy just north of the house. Arthur Paul, a brother-in-law of Mrs. Carrie Paul, was sick later in April, and, in June, his brother George was sick. The surroundings of houses No. 3 and No. 4 were healthy. This completes the history of the first group ; and

the conclusion of both Dr. Cooley and myself is that the disease probably originated in the unhealthy condition of dwelling No. 1, and spread by the element of contagion.

The Bovee family lives nearly two miles north from Day Center, on the mountain road and probably 200 feet higher. There is low ground west of the house, and the immediate surroundings are not perfectly healthy. We were informed that two cases of fever occurred in the family who occupied this house in 1881, but were unable to get particulars. Previous to the sickness in the Bovee family, the house cellar had contained stagnant water. Since then it has been properly drained. George Bovee was brought home sick from Saratoga on September 3d, and on September 8th Eunice was brought home sick from Luzerne. A little later Orrie was taken sick at home. The conclusion must be that, however unhealthy the environment of the house may have been, the sickness was imported.

Of the third group, Miss Paul was the first one sick. She is a sister of Mrs. C. H. Mills. She was brought home sick from Charlton in August. She had intestinal hemorrhage.

In September, Mrs. C. H. Mills, the sister who had the care of Mrs. Paul, was taken sick. At the same time Mrs. Mills the elder, mother-in-law of Mrs. C. H. Mills, living next door, was sick. During the convalescence of Mrs. C. H. Mills, her child died of cholera infantum.

In this group the disease seems to have been introduced by Miss Paul from Charlton. The sanitary condition of the two houses is good. The water used for drinking was spring water brought in log pipes.

I have the honor also to report that, on the 26th of October last, I investigated an endemic of enteric fever, which had prevailed up to that time from July preceding in the house of Stephen Chase, in the town of Broadalbin, in Fulton county. Mr. Chase himself was the first sick, and was taken in July and died August 6. He had the characteristic typhoid eruption, and a severe intestinal hemorrhage. In all there were five persons sick. The surroundings were all healthy, except that the well fifty feet deep, stoned up, is twenty-one feet from the hog-pen, which has been in the same place for thirty years. The soil is sand and gravel, and the site is probably 100 feet above the Sacandaga.

Respectfully submitted,

EUGENE BEACH.

FEVERS AT INDIAN LAKE.

It was found that there had been at Indian Lake in the last half of 1881 and the first quarter of 1882, covering a period of about eight months, twenty-eight cases of sickness, with three deaths, which as most of them were fevers, are all reported under that head.

The most of these were doubtless, judging from the account of symptoms to be obtained at this time, enteric fevers. To this there are a few exceptions which will be noted. It was difficult to obtain an accurate and complete history of the symptoms, but such an account of symptoms of individual cases as could be elicited without the use of many leading questions is here given. It was impossible

to learn the local sanitary condition of houses and their surroundings at the time of the sickness, but such facts as could be drawn out on these points and also with reference to the sanitary management of the sick are reported. Dates in many cases could be only approximately obtained.

The first cases were in the family of Celestine Savori, which consisted of thirteen persons, viz.: Savori, his wife, his brother and ten children. In this family there were ten cases and all recovered. Savori lived on the south bank of the lake on tolerably elevated and dry ground, about three miles in a direct line from Indian Lake village. He had lived there seven years. He states that the premises were not filthy. The drinking water was obtained from a spring fifteen rods distant from the privy. The privy had been made new in the spring preceding the sickness. The old privy was a vault about four feet deep and was half full when the new one was made. This old vault was filled with earth. It had been used two years. Slops from the kitchen were thrown into a barrel and carried to the hogs. The location of the hog-pen was not learned.

During the sickness discharges from the bowels were immediately carried out and buried. The Indian Lake dam was tripped about August 1. Savori had been working on the farm of Griffin some three miles farther up the lake and on the opposite side. In going and coming he must necessarily cross the lake. He attributes his sickness to the condition of the uncovered marsh. He had been to Minerva just previous to his illness and was not quite well when he went.

Savori was taken sick the last of August, 1881. He had headache, delirium, diarrhœa with yellow stools, fever, no eruption, no tympanites. He was sick four weeks and recovered.

Jerry, aged eighteen years, was taken sick two days after his father. Headache, diarrhœa, with yellow stools, and fever were the principal symptoms. He recovered after three months.

Gideon, aged fifteen years, was taken sick two weeks after his father. The symptoms were headache, nosebleed, diarrhœa and fever. Improved after three weeks, had a relapse and finally recovered.

Lester, aged twenty years, was taken sick one week after Gideon. His symptoms were chills, headache, nosebleed, vomiting and diarrhœa with yellow stools. He recovered after four weeks.

Peter, aged eight years, was taken sick about the same time as Lester. He had headache, chills, nosebleed, delirium, diarrhœa, with yellow stools, and fever. He was sick six weeks and recovered.

Rosa, aged six years, was taken sick about the same time with chills, headache, diarrhœa, with yellow stools, and fever. She was sick two weeks and recovered.

Louisa, aged ten years, was taken sick a few days later with headache, nosebleed, vomiting, diarrhœa, with yellow stools. Recovered after three weeks.

Hattie, aged eighteen years, was taken sick two days after Louisa. She had headache, nosebleed, diarrhœa, with yellow stools, delirium, and fever. She was sick four weeks and recovered.

Olive, aged two years, was taken sick at the same time as Hattie. She had headache, diarrhœa, with yellow stools, and fever. She was sick four weeks and recovered.

Lavina, aged thirteen years, was taken sick two days after Olive. She had headache, nosebleed, hemorrhage from bowels, diarrhœa, with yellow stools, and fever. She was sick three months and recovered.

Gideon, brother of Savori, aged twenty-one years, was taken sick about the same time as Olive and Lavina. He had headache, backache, delirium, diarrhœa, with yellow stools, and fever. He recovered.

Chauncey Hill lived on Cedar river some three or four miles from Indian Lake village, and as far from the lake itself, with a mountain between. He was taken sick September 5, 1881. His symptoms were headache, backache, diarrhœa, with yellow stools, and fever. He was sick seven weeks and recovered. I was unable to learn that there were any local causes for his sickness or that he had been among those sick with the fever, but I was unable to see Mr. Hill himself.

Philandar Ovits lived still farther up the Cedar river, perhaps a mile beyond Chauncey Hill's. No local cause of sickness could be discovered. Mr. Ovits was taken sick in September, 1881. He had headache, diarrhœa, with yellow stools, *eruption* and fever afterward, pulmonary hemorrhage and cankered throat. He was sick four weeks and recovered.

R. B. Jackson lives on the Cedar river two miles beyond Indian Lake village, and is proprietor of Jackson's hotel. His son Eugene, aged twenty-one years, was taken sick in September, 1881, with headache, sore throat, reddish-blue eruption, fever, tympanites, cankered throat and pulmonary hemorrhage. His doctor called the disease typhoid pneumonia. He died October 11, from pulmonary hemorrhage.

Albert Persons lived about one-half mile west from Indian Lake village, toward the lake. He was a married son of B. W. Persons, mentioned below. The local surroundings of his residence were apparently healthy. He was taken sick about the middle of September, 1881. His disease was called typhoid fever. He got better of the fever and died finally after four months of a kidney difficulty. His father said he had "stoppage of water."

The family of B. W. Persons consisted of six persons, himself, his wife and three children. He lived in the village. Mary, aged fourteen years, was taken sick about October 1, 1881. She had headache, delirium, diarrhœa, hemorrhage from bowels, and fever. She was sick five weeks and recovered. The passages from the bowels in this family were sometimes thrown into the privy, and sometimes on the ground.

Walter, aged fifteen years, was taken sick about November 1, 1881, with slight febrile symptoms, and recovered in ten days.

Joseph, aged ten years, was taken sick about the same time as Walter, and was sick about the same length of time and in much the same way. Not much diarrhœa with either of them.

Isaac Pinney lived in the village opposite Wilbor's hotel. His son Chauncey, aged twenty-one years, was taken sick about October 2, 1881. He had what the doctor called remitting fever. He was sick seven weeks and recovered.

Joseph Locke's family consisted of himself, aged twenty-eight years, his wife, aged seventeen years, and the baby, aged nine months. He lived near his father, W. W. Locke, on the north bank of Indian lake, three miles west from the village. The local conditions were appar-

ently healthy. He had been working in the woods where he was obliged to drink swamp water. He attributes his sickness to that cause. He was taken sick the second week in October, 1881, and was sick ten weeks. He had headache, nosebleed, delirium, diarrhœa, with ochre-colored stools, tenderness of bowels, tympanites, profuse eruption and fever. He recovered.

His wife was taken sick a week after her husband. She had delirium, diarrhœa, with yellow stools, tympanites and fever, and died on the twenty-first day.

The baby was taken sick about the last of December, 1881, and was sick two months. It had diarrhœa, with yellow stools, tympanites and fever. Recovered.

The local surroundings of the residence of W. W. Locke appeared to be excellent. Mr. Locke is citizen member of the town board of health and an intelligent man. His family consisted of four persons — himself, his wife, his wife's mother and Miss Eliza Porter, a granddaughter. After the death of its mother, Joseph Locke's baby was brought there.

Mr. Locke was taken sick in December, 1881. He had assisted in the care of his son Joseph and had personally attended to the burying of the discharges from the bowels. He had fever for fifteen days and kept his bed twenty-nine days. He had headache, tympanites and fever reaching one hundred and two and one-half degrees Fahr. varying daily from one to two degrees. He had no diarrhœa, not much tenderness of bowels and no eruption.

Miss Porter, aged seventeen years, had charge of Joseph Locke's baby, and washed the baby's diapers without their having been previously disinfected. She was attacked in the latter part of January, 1882, and recovered after six weeks. Her symptoms were headache, nosebleed, delirium, eruption, tympanites, diarrhœa, with yellow passages, and fever.

John Lawrence lives about two miles west from Locke's. His family consisted of six persons. Only one was sick, viz.: Edna, aged nineteen years, she had visited the sick at Locke's.

She was taken sick in March, 1882. She had headache, diarrhœa, tympanites, hemorrhage from lungs and fever. She recovered after six weeks.

Joel Brooks lived in the village of Indian Lake. Six children in this family had diphtheria in September, 1881. About January 1, 1882, Mrs. Brooks was attacked with fever, and recovered after six weeks. Her symptoms were chills, fever, vomiting, cough and delirium. The doctor called it a case of bilious fever.

James Eldridge, in January, 1882, lived in the village. About January 1, George, aged nine years, was taken sick and recovered after four weeks. His symptoms were fever, cough, with rusty sputa, and diarrhœa. The doctor called the case typhoid pneumonia.

Warner Porter died of fever in January, 1882. He had been working on the Blue Mountain lake road and drinking swamp water. He attributed his sickness to that cause.

FEVERS AT BLUE MOUNTAIN LAKE.

In the latter part of September, 1881, a young man named Martine died of fever at North Creek. Miss Lizzie Martine, his sister, was teaching school there at the time. About October 10, 1881 — some two weeks after the death of her brother—Miss Martine was taken sick. Her age was eighteen years. She was sick at Holland's hotel, Blue Mountain lake, having come there after the death of her brother at North Creek. She was attended by her brother, Dr. G. R. Martine, now of Glens Falls. She was sick three weeks and died.

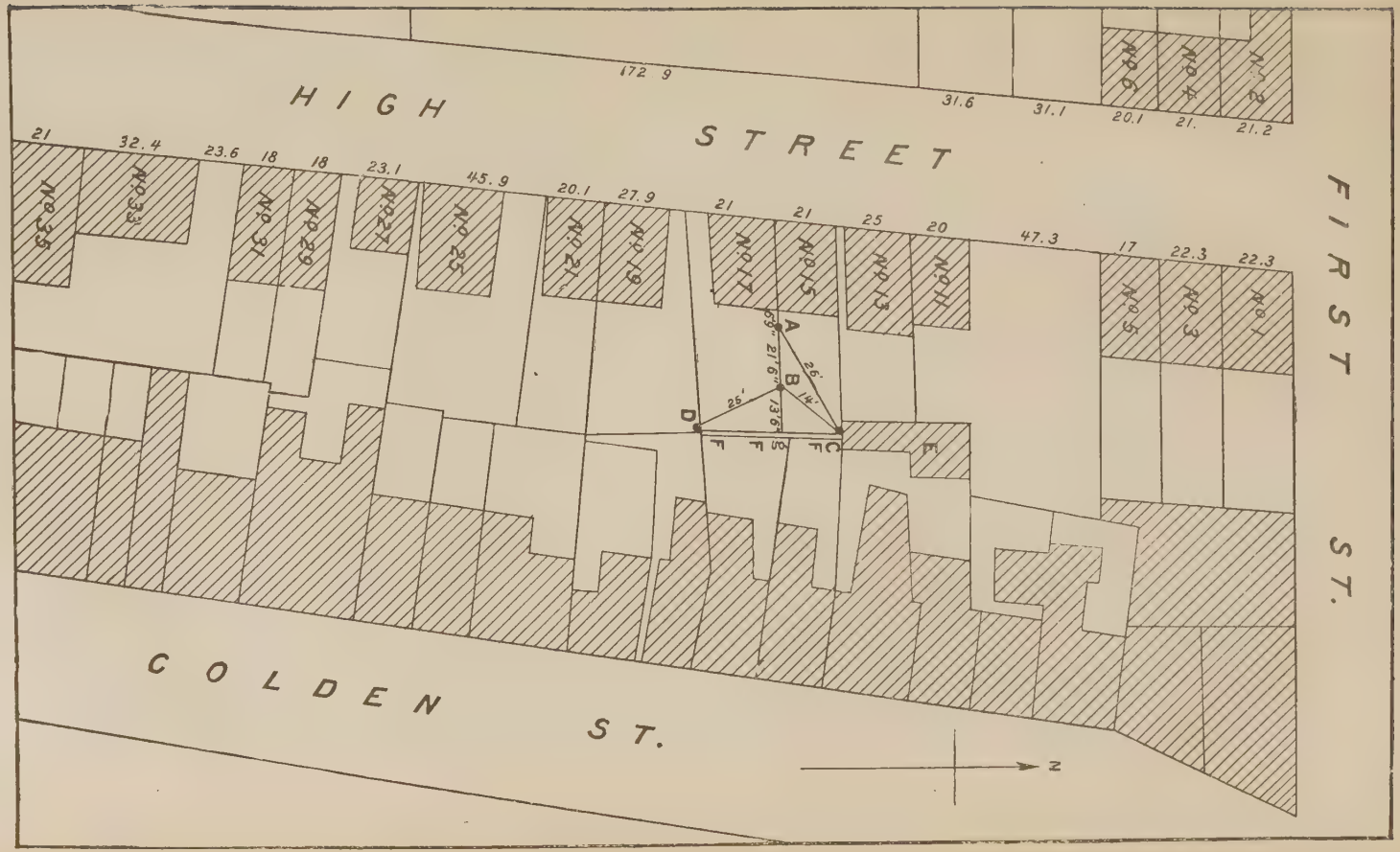
About a week after the death of Miss Martine, Mr. Holland's boy, aged five years, was taken sick with apparently the same disease and died at the end of three months. Neither the boy nor Miss Martine had diarrhœa or eruption. Mr. Holland was unable to give me very minute particulars of the symptoms of these cases, but referred me to Dr. Martine.

James Bartlet assisted in the care of the sick at Holland's. He was taken sick Thanksgiving day, 1881. He was sick in bed seven weeks. He had fever, cough, spitting of blood, diarrhœa and difficult breathing. The disease was called typhoid pneumonia. He was sick at Holland's. He recovered.

FEVERS AT INDIAN LAKE.

NAME OF FAMILY.	Individual.	Age.	Date.	Duration.	Termination.
Savori, Celestine..	Himself.....	....	Last of Aug., 1881.....	4 weeks...	R.
	Jerry.....	18	Two days later.....	3 months.	R.
	Gideon, Jr...	15	Two weeks later.....	3 weeks...	R.
	Lester.....	20	One week after Gideon...	4 weeks...	R.
	Peter.....	8	Same time.....	6 weeks...	R.
	Rosa	6	Same time.....	2 weeks. .	R.
	Louisa.....	10	Few days later.....	3 weeks...	R.
	Hattie.....	18	Two days later.....	4 weeks...	R.
	Olive..... ..	2	Same time.....	4 weeks...	R.
	Lavina	13	Two days later.....	3 months.	R.
	Gideon, Sr...	41	Same time.	.....	R.
Hill, Chauncey...	Himself	31	Sept. 5, 1881.....	7 weeks...	R.
Ovits, Philander..	Himself	....	Sept., 1881.....	4 weeks...	R.
Jackson, R. B....	Eugene.....	21	Sept., 1881.....	Till Oct. 11.	D.
Persons, Albert...	Himself	....	Sept. 15, 1881.....	4 months.	D.
Persons, B. W....	Mary.....	14	Oct. 1, 1881.....	5 weeks...	R.
	Walter.....	15	Nov. 1, 1881.....	10 days....	R.
	Joseph	10	Nov. 1, 1881.....	10 days....	R.
Pinney, Isaac....	Chauncey....	21	Oct. 2, 1881....	7 weeks...	R.
Locke, Joseph....	Himself	28	Second week in Oct., 1881,	10 weeks...	R.
	Wife.....	17	Third week in Oct., 1881..	21 days....	D.
	Baby.....	9 m.	Fourth week in Dec., 1881,	2 months.	R.
Locke, W. W....	Himself	59	Dec., 1881..... .	4 weeks...	R.
	Miss Porter..	17	Last of Jan., 1882.....	6 weeks...	R.
Lawrence, John..	Edna.....	19	March, 1882.....	6 weeks...	R.
Brooks, Joel.....	Mrs. Brooks.	29	Jan. 1, 1882.....	4 weeks...	R.
Eldridge, James..	George	9	Jan. 1, 1882.....	4 weeks..	R.
Porter, Warney..	Himself	....	1882.....	.....	D.

Total at Indian Lake, 28 cases, with 4 deaths.


HIGH STREET
FIRST ST.
COLDEN ST.
172 9
31.6
31.1
20.1
21.
21.2
No 5
No 4
No 2
21
32.4
23.6
18
18
23.1
45.9
20.1
27.9
21
21
25
20
47.3
17
22.3
22.3
No 35
No 33
No 31
No 29
No 27
No 25
No 23
No 21
No 19
No 17
No 15
No 13
No 11
No 5
No 3
No 1
A
B
C
D
E
F
63°
21'6"
26'
14'
25'
13'6"
N

FEVERS AT BLUE MOUNTAIN LAKE.

NAME OF FAMILY.	Individual.	Age.	Date.	Duration.	Termination.
Holland's hotel...	Lizzie Martin.	18	Oct. 10, 1881.....	3 weeks....	D.
	Holland's boy	5	Nov. 6, 1881.....	3 months ..	D.
	Jas. Bartlett.	....	Last of Nov., 1881.....	7 weeks....	R.

Total at Blue Mountain Lake, 3 cases, with 2 deaths.

NEWBURGH, *September* 1, 1883.

Dr. ELISHA HARRIS:

DEAR DOCTOR — I send you a report of the outbreak of typhoid fever, in High street, in this city, with accompanying map of the infected district.

The colored part of the map indicates the portion occupied by buildings, not including out-houses.

The ground falls rapidly to the north and east. The west side is much higher than the east and is thinly peopled.

The houses on the east side are mostly two-storied in height and occupied as dwellings.

The buildings on Colden street are most three-stories in height, stores on the first floor and dwellings above.

Both streets have been built up many years. There is no sewer in either High or Colden streets. The houses in High street are usually drained across the Colden street lots into private drains which are numerous in the latter street.

The suspected well (B) is located on the dividing line between Nos. 15 and 17 High street. It is seventeen feet two inches in depth and contained, when examined, three feet six inches of water.

There is nothing suspicious in taste or appearance of water.

A solution of nitrate of silver gives, with the water, a decided precipitate not soluble in nitric acid but soluble in ammonia. A represents a slop-basin connected by a drain with privy vault C. This basin and the vault C are used in common by the residents of both houses.

F, F, F, represent a solid stone retaining wall. The Colden street lots are twenty to twenty-two feet lower than the lots on High street.

The vault C communicates with another vault about ten feet lower, intended to be used by residents of second story of uninhabited tenement E.

This second vault communicates with a third, ten feet lower, which is drained by a rough stone drain, a few inches below the surface of the ground. This drain discharges somewhere in Colden street.

The surface of contents of *upper story* of vault C is eleven feet six inches below surface of ground. It is fourteen feet distant from well.

At the base of wall on Colden street side, marked g, is another large privy vault, the contents of which are about twenty-four feet below the level of lot above.

D represents another privy vault twenty-five feet distant from well and close to retaining wall. This vault is full to within three and one-

half feet of surface of ground. Fall of ground toward the well is two and one-half feet. The contents of this vault are semi-liquid and ooze through the retaining wall ten feet below the surface. The house waste and rain water flow into this vault which is connected by a drain with another vault below. The drain is evidently choked.

The well is excavated for some distance out of the slate rock which underlies the soil in this section.

There is reason to believe that there is an overflow from the well, but I have not been able to verify the report.

A gentleman who occupied the house some years ago says that the water was foul but they opened the drains below and then it was all right.

The cases of fever have been as follows :

At No. 1 High street, two cases, one fatal.

At No. 3 High street, two cases, one fatal.

Two other patients in No. 3 were attacked with premonitory symptoms but the fever ran a short course.

At No. 11 High street, one case, mild.

At No. 19 High street, three cases, severe.

At No. 27 High street, one case, fatal.

At No. 2 High street, two cases, severe.

At No. 4 High street, three cases, fatal.

At No. 6 High street, three cases.

Several other persons suffered from premonitory symptoms. There were in all at least sixteen well-marked cases of fever.

Three of the fatal cases were attended with severe hemorrhage of the bowels.

The symptoms of the fever have been a general feeling of lassitude or weariness, loss of appetite and indisposition to physical exertion for days before taking to the bed, headache, diarrhœa, pains in the limbs, chilly sensation without a decided chill, tympanites, pulse ranging from 96 to 150, temperature ranging from 100 degrees to 105 degrees, gradually attaining the maximum, with evening exacerbations, no true remission, brown and dry tongue, delirium epistaxis, hyperæsthesia, rose colored spots, hemorrhage of the bowels.

All of the persons affected had used the water. No person in the neighborhood contracted the fever who did not use the water.

There have been no new cases since the public ceased using the water.

It is true some used the water without any bad results. Had an equal number of persons been exposed to scarlatina a much larger proportion would probably have escaped, yet no one would doubt that the disease was communicated to those who became sick. All are not equally susceptible.

Seven of the cases were under my charge; one aborted at about the end of the second week, five have recovered, one proved fatal after convalescence, suffering a relapse.

I do not doubt that my cases were all simple typhoid fever.

I believe the well was the means of propagating the disease.

I do not believe any well with such surroundings can be used without incurring great risk.

Yours truly,

R. V. K. MONTFORT.

Endemic in Putnam County.

Carmel, Putnam Co., N. Y.,
November 1, 1883.

Dr. Elisha Harris, *Secretary State Board of Health, Albany, N. Y.:*

Dear Sir — In compliance with the request made in your communication of September 26 I have the honor to submit the following report of the endemic which has prevailed in this village during the past summer.

It is my purpose to embody in this report the knowledge of the disease derived from the cases that have come under my immediate observation, and also such reliable information as I have been able to obtain from other sources.

I shall not attempt to give a clinical history of all the cases observed, but will describe a typical case of the disease and some of the peculiarities manifested in cases not typical.

The mode of invasion in most of the cases was abrupt, commencing with pain in the umbilical region, and diarrhœa, these symptoms lasting from one to three or four days, when dysenteric symptoms developed. With the appearance of mucus and blood in the stools there was loss of appetite, coated tongue of a yellowish-white color, the pulse but little, if any, above the normal frequency, temperature seldom above 101, usually below 100, respiration not disturbed, skin dry, thirst not excessive, bowels moving from six to twenty times in twenty-four hours, evacuations attended with both griping and tenesmus, stools small, consisting of coagulated mucus and blood, the latter florid and small in quantity. Nausea and vomiting were remarkably absent. The dysenteric symptoms sometimes abated in from four to seven or eight days, the stools becoming fœcal and less frequent. Now when every thing looked favorable a sudden change occurred. The patient became delirious. The delirium was of a boisterous character and suddenly developed. The patient wants to be dressed, wants to go home, wants to go out, is occupied with his usual avocation, and requires restraint to keep him in bed. The tongue becomes dry, the pulse slow and feeble, the temperature below 100, the surface, especially of the extremities and face, cool. After two or three days these symptoms pass off in some cases and convalescence is established. In others the delirum continues, the temperature remains low, the pulse becomes rapid, and death ensues from exhaustion usually at the end of the second week. In a small proportion of fatal cases the flux continues to the end.

There has not been observed in any of the cases, sorded on the lips and teeth, tympanites or high temperature, excluding, as I believe, typhoid fever from the diagnosis. That there has been a subtle and profound poison affecting the nervous system is true, and that poison, I am convinced, is a filth-poison arising from local unsanitary conditions.

The first case that occurred was that of James J. Dakin, sheriff of the county, who was taken sick July 18. His residence was the court-house, marked one on the accompanying chart. I did not attend the case but should judge from what information I have been

able to obtain that it was a typical case. The case terminated fatally in ten days; enteritis was the leading feature. Dysenteric symptoms appeared about one week after the invasion of the disease and about the same time he became delirious. The calites, dysenteric discharges and delirium continued to the fatal issue.

Miss Fisher at the dwelling marked two was the next case. This was thought to be a case of ordinary catarrhal dysentery, was apparently nicely convalescent at the end of a week and died suddenly at the end of the second week. I am told that during this last week there were neither dysenteric symptoms, diarrhœa nor delirium.

The next cases occurred at four in the family of Silas Currie. This family lived in ill-ventilated apartments in the basement of four, which basement fronts on the lake. There were two cases of dysentery and one of diarrhœa in the Currie family; all recovered. Mr. Currie, aged about sixty years, was the first and most severe case. Dysenteric symptoms were protracted, prostration great, nervous symptoms wanting.

A son about twenty years of age was the next; sick about one week with dysentery. Younger son, about fourteen years of age, sick two or three days with diarrhœa.

The next cases occurred at the old tenement marked six. Three cases occurred here; all died. Riley Smalley, aged about sixty-five, sickened first. Nervous symptoms early developed and continued to the end. Grandchild of Smalley, about two years old, sickened next and died in a few days. Thomas Burnford, age about forty-five, nervous symptoms early and well developed; lived ten or twelve days after attack.

This old tenement stands on low ground, the soil alluvial, the surface about the house saturated and covered with wash water and kitchen slops and garbage, an ill-conditioned privy and pig-pen immediately behind the house.

James H. Merritt, dentist, living in dwelling marked three, was the next fatal case. Nervous symptoms present and well marked, dysenteric symptoms abated several days before death; as near as I can recollect lived twelve or fourteen days; did not see the case. One other case occurred in this house, a lady of seventy or more years, very mild case; recovered.

The premises marked seven is Conrad Sickler's house. Six cases occurred here with two deaths. A family by the name of Richardson occupied part of this house. In this latter family the first case occurred; child six years of age, sick three weeks with catarrhal dysentery without nervous symptoms; recovered.

The second case was Mrs. Richardson. She had severe catarrhal dysentery, without delirium, but attended with extreme prostration and ulceration of bowels, discharging considerable quantities of pus and shreds during the last two weeks of her illness, which lasted full six weeks before convalescence could be said to be established.

The third case was Mrs. Sickler; prostration and delirium came on early, and she died on the eleventh day.

Fourth case, Mr. Richardson; mild case, without delirium, though somewhat protracted, and attended with great prostration; recovered.

Fifth case, Mrs. Richardson's baby, thirteen months old, sick few days; died.

Sixth case, Conrad Sickler, severely sick, delirium lasting several days; prostration extreme; case protracted about one month; recovered.

The sanitary conditions about the Sickler house are decidedly bad. The part of the house occupied by the Richardson family has no cellar, the water standing flush with the floor boards in stormy weather, and at all times taking the surface drainage from the ground, rising to the west, and occupied by two pig-pens and one privy, all of which are in a very filthy condition. One pig-pen is twenty-seven feet from the house, the other thirty-five, the latter pig-pen is thirty-three feet from the well. Ten feet from the well is an old privy vault covered with earth; this is where the privy stood before the well was dug. The well water was very turbid after rain, although it does not get the direct drainage from the pig-pens and privy.

At five two cases of dysentery occurred; both recovered. The first case was one of moderate severity, and was convalescent in nine days.

The second case yielded nicely in five days as far as the flux was concerned, although the appetite and sleep did not return. During the night of the sixth day the patient became delirious, pulse slow, skin cool, temperature taken under the tongue ninety-nine and a fraction.

Although the violence and delirium were partially controlled by brom. potas. and chloral hyd. and sulphurous acid given continuously, these symptoms lasted forty-eight hours, when convalesence begun, and the patient made a slow but good recovery.

In what may well be called the filth district, the mortality was unusually large. This district includes five, six and seven of the chart. In these three dwellings there were eleven cases, of which five died.

There occurred in my practice twenty-one cases of dysentery, two of which terminated fatally.

Dr. La Monte reports twenty cases, with five deaths.

Dr. Ely treated eighteen cases with four deaths.

In the practice of the three physicians of this village there occurred fifty-eight cases with eleven deaths. The territory represented by these cases includes an area of six or seven miles radius. During the epidemic there occurred in the practice of the three physicians twenty-three cases of diarrhœa and cholera morbus.

As will be seen from the foregoing the entire number of deaths in the village was eight.

Through the kindness of Mr. Thomas Manion, superintendent of Croton water lakes and reservoirs in this county, I am able to send you with this report records of the thermometer, direction of wind, weather and rain-fall for the months of June, July, August and September, 1882 and 1883.

The causes of the endemic operating with great force the past summer, on account of unusually heavy rains and cold weather, are: 1. Impure water; 2. Extremes of temperature; 3. Filth poison.

I am very respectfully,

Your obedient servant,

J. Q. ADAMS.

REPORT OF INSPECTION OF PISCAWAN CREEK, NORTH TROY.

LANSINGBURGH, N. Y., *September* 8, 1883.

DEAR DOCTOR — We have in our village a small locality where typhoid fevers have been unusually prevalent this season. Near it is a stream which the city of Troy has obstructed by building. Whether it is this stream or the drinking water which causes the trouble is not settled. If you feel that such a statement brings the case within the province of the State Board of Health I would be pleased to meet you here at any time you will name, or will be thankful for any suggestions touching the case.

Very truly yours,
E. W. CAPRON.

Dr. ELISHA HARRIS, *Secretary of the State Board of Health:*

SIR — Yesterday, October 23, 1883, I visited Lansingburgh and examined the course of a small stream which had been the subject of recent complaint, and to which typhoid fever and other local disease is attributed. I was accompanied by the health officer of Lansingburgh, Dr. Capron, also by Mr. Amasa R. Moore and one or two other gentlemen thereabout resident.

This stream rises in the edge of the hills back of Lansingburgh from springs, and, following a nearly straight course toward the southwest, gradually approximates the Hudson river to about the Troy city north line; thence its course is southward parallel with the line of the river for about four blocks to Douw street, where it turns abruptly west and empties into the river just above the State dam.

The size of the stream is very variable, bringing down large volumes of water after heavy rains, and soon dwindling to insignificance and almost drying away. Its bed is sufficiently capacious for freshets and is much of the time but partly covered; it is a bed of soft clay. After reaching the city it receives contributions from another stream of similar size coming down from the north, and also from house conduits.

Through much of its course it is very sluggish; there is hardly any fall down to Glen street in North Troy near city line; thence to Douw street there is a fall of five and one-half feet, and from there to its mouth as much more.

Geologically the stream runs through a coarse gravel soil, or drift, or stiff, blue clay — the surface of the clay varying considerably in depth, at some points being fifteen or twenty feet below the top of the soil, and at others coming to the surface. The rock, which is shale, comes to the surface at few points north of the so-called Mount Olympus.

Topographically, from an abrupt line of hills one-fourth to one-half mile back of the river, there is a comparatively level plateau north of Mount Olympus. There is, however, a depression back from the river along the line of the creek which, through the fields back of Lansingburgh, is two feet below the highest noted water-mark. It is confined by abrupt banks, however, only at one point spreading out in a slough.

North of the Troy city line there is no house on or near the stream, which runs through pasture lots. Below this point it soon approaches the houses on Vail avenue, a pretentious street, and continues so for three blocks. Its bottom is muddy and soon obstructed by foreign refuse through which it finds its way with difficulty. House conduits run into it all along, and numbers of privies are set over it, and accumulations from which line its course. It finds its torpid way, trickling over the oozy bottom, along back yards, close to houses, in some cases new structures being in process of erection directly over it, sometimes planked over loosely, or coursing under bridges from the edge of which a nauseating odor arises, growing more and more vile as it gets richer in contributions along its course, finally emerging into the all-absorbing river. It sometimes plays a different role, in high water filling cellars to a depth of two or three feet.

As to sickness caused by it I had to take my information for the most part at second hand. But intelligent persons resident there told me of the existence of typhoid fever, diphtheria and prolonged malaria as prevalent. I visited one family only where there had been sickness. Fatal diphtheria has been reported especially. The odor arising from the creek was generally complained of. It is hard to believe that there could fail to be sickness as reported.

The need of a remedy is apparent when it is known that this region is very rapidly building up. There is no other place for Troy to expand into, and even in spite of this unsanitary state houses are building, even directly over it. The well-conducted horse car line makes this available territory. At present it is not a safe place to live in, for not only is there this stream, but the flat surface is in many places the locality of springs, and also there has not yet been constructed a single sewer for this entire region. They do receive, however, water from the city service. There is no outlet for drainage but this creek.

The remedy is to build a main sewer to carry off all this flow and refuse. Where and how is for an engineer to determine, but the most feasible seems to be to carry it down North Fourth street to Rensselaer, or thereabouts, and so out below the State dam to the river. This would give an abundant fall and would easily drain the entire region and relieve it of its present unsanitary state. Without this remedy this region is, or will soon be, unfit for human habitation.

Respectfully yours,
F. C. CURTIS,
Sanitary Investigator.

LANSINGBURGH, N. Y., *Sept.* 28, 1883.

DEAR DOCTOR — I send you by express to-day four bottles of water from different mills in our infected district. I have marked them No. 1, 2, 3 and 4. I wish in your analysis you would do so as to be able to report on each number separately, as I shall then know what particular well each report fits.

Truly yours,
E. W. CAPRON.

Your letter received and this in reply.

ALBANY, *January* 23, 1884.

Dr. E. HARRIS, *Secretary, etc., Albany:*

DEAR DOCTOR — I have made an examination of the two samples of well-water from Lansingburgh, sent to me by you January 8, 1884. Such examination being as complete as the limited amount of water sent in each case would permit.

The sample marked "No. 2" (my number 8,031) possessed the odor of sulphuretted hydrogen and turned milky on standing with a flocculent deposit of dark color. On moving the water it emits a disagreeable odor. The amount of chlorine is low in this water (.80 parts in 100,000) but it rapidly decolorizes an alkaline solution of permanganate of potash. From this superficial examination I should consider the water unfit for use.

The sample marked "No. 4" (my number 8,032) has a slightly milky appearance and has a brownish flocculent deposit. On testing it develops a somewhat disagreeable odor. The amount of chlorine in the water is excessive, being 10.40 parts for 100,000. This water also rapidly decolorizes the permanganate solution though not so speedily as No. 2. The amount of water was too small in both cases to allow the amount of "oxygen absorbed" to be accurately determined.

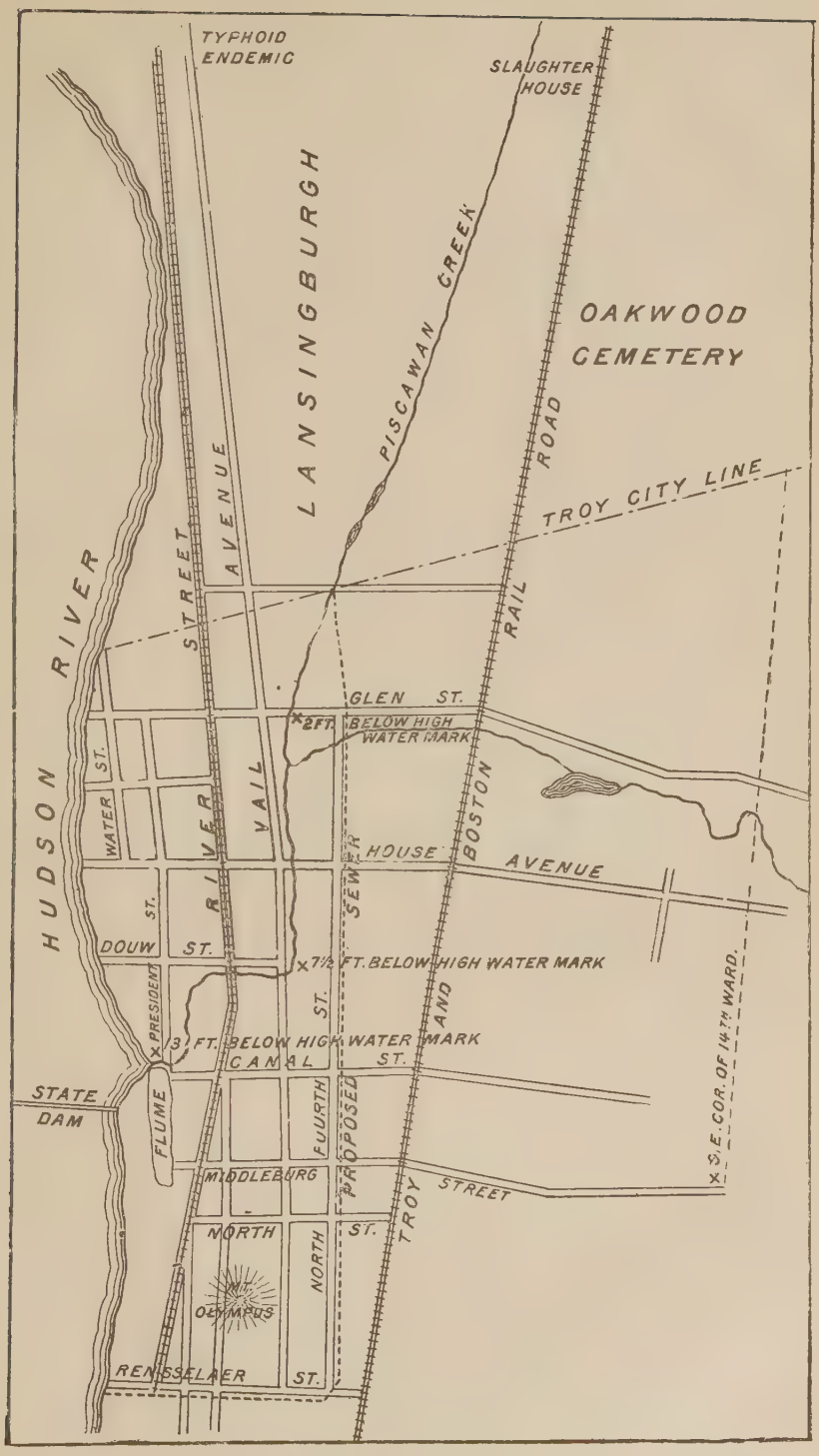
I should consider No. 4 from the superficial examination to be a filtered water unfit for domestic use.

I am yours, respectfully,
WILLIS G. TUCKER.

ALBANY, *September* 11, 1883.

Dr. E. HARRIS, *Secretary State Board of Health:*

DEAR DOCTOR — I visited Lansingburgh to-day and with Dr. C. W. Capron, health officer of the village, inspected the locality and suspected causes of an endemic of what is pronounced by him and other competent authority typhoid fever. It has prevailed every fall for a few years, and this year over a limited area a considerable number of cases have occurred and some deaths. They have been in well-built and kept houses on both sides of River street, and on the street west — in fact to its limits, which are narrow. It is most prevalent at about the Troy and Lansingburgh line and for two blocks north. The land you know is flat from the river, the banks of which are precipitous, perhaps ten feet high — back to the hills on which the Troy cemetery is located, which rise abruptly. To the north of the village and along the foot of these hills a little stream arises and running generally south gradually approaches the village, into which it runs from about a block north of the Troy line and so on, just back of the village edge, down to the river, half a mile or so below. Before reaching the village no houses are upon it except one recently built and at a little distance away, and back near the hills, and probably one hundred yards distant is a slaughter-house. It is an *extremely sluggish* little stream. A four-inch pipe would carry all its water to-day, though at times it is quite high, but it spreads over a bottom four feet wide, at places


TYPHOID ENDEMIC
SLAUGHTER HOUSE
LANSINGBURGH
PISCAWAN CREEK
OAKWOOD CEMETERY
HUDSON RIVER
STREET
AVENUE
RAIL ROAD
TROY CITY LINE
GLEN ST.
2 FT. BELOW HIGH WATER MARK
WATER ST.
RIVER WALL
SEWER
HOUSE
BOSTON
AVENUE
DOUW ST.
7½ FT. BELOW HIGH WATER MARK
PRESIDENT ST.
3 FT. BELOW HIGH WATER MARK
CANAL
ST.
STATE DAM
FLUME
FOURTH
PROPOSED
TROY STREET
S. E. COR. OF 14TH WARD.
MIDDLEBURG
NORTH
ST.
OLYMPUS
RENSSELAER
ST.

spreading out to ten feet, and its bed is a mass of soft black ooze, the water very filthy from cattle standing in it, and covered with vegetable growth. The odor from it is mostly of a swampy character. Crossing the Troy line the bed is obstructed by refuse, and privies empty apparently into it; the odor from it is fæcal and foul. It is almost motionless at best. There is every chance for it to become a breeding nest of disease for North Troy more than Lansingburgh. It ought to be made a covered sewer and might best I should think be turned directly to the river, some sixty or eighty rods distant from the city and village line. I doubt if it has much to do with the typhoid endemic at issue. (I may say that Dr. Capron, who has lived and practiced seventeen years in Illinois, has seen but three cases of *malarial* fever proper in this village.) I think the disease can be traced to the condition of the respective premises affected. I called on one or two families, and inspected one house well. Professor Baker has lost two or three children within two years, and two are now sick. He has a new, pretty house and grounds sloping back to the river thirty feet back of the house. He has put through his house a drainage pipe of four inches to which a water-closet, basins and kitchen sink open, each, as he took pains to show, having a trap. There is no water supply and the basins are never used. The water-closet on the upper floor on which the children slept was a receptacle for chamber slops and urine only. The pipe takes roof water in part (part going to a cistern); it empties into a six-inch pipe in the yard which, also trapped, runs back to the privy on the river edge and receives, through *hopper* arrangements, its accumulations, and all is projected to the river below. I advised him to ward off the abundant accumulations from the hoppers — to freely use sulph. iron solution and as soon as he could destroy the whole thing — to seal impermeable all his house basins except the kitchen sink and to cut it off from the privy and run straight to the river. This is a sample, enough perhaps to infect a neighborhood. Other houses are in their way as bad and the need is there for local house sanitation. The stream ought also to be cleaned by Troy and Lansingburgh and ultimately covered.

Respectfully,
F. C. CURTIS.

REPORT

ON

SUDDEN OUTBREAK OF ENTERIC FEVER AT PORT JERVIS, DURING THE FALL OF 1883.

BY

DR. F. C. CURTIS.

To J. SAVAGE DELAVAN, M. D., *Chairman of Committee:*

About the 1st of November, 1883, attention was called to the very unusual and alarming prevalence of enteric fever in the village of Port Jervis, there having occurred, within a very short time, a large number of new cases. This fact was represented to the State Board of Health, in an official communication from the president and health officer of the village board, on the 10th of November, and I was instructed to make an inquiry into the causes of the epidemic. I accordingly visited Port Jervis for this purpose November 14, and about the middle of December made a supplementary visit there, spending two or three days at each visit.

To properly represent this outbreak it is necessary to outline the region subjected to it. Port Jervis, to the environs of which it was entirely limited, is a village of about eight thousand or nine thousand inhabitants. It is situated in the town of Deerpark, at the extreme eastern part of Orange county, and just opposite the intersection of the Pennsylvania and New Jersey State lines. It is separated from the territory of these States by the Delaware river, here a broad but shallow stream, not navigable, and of somewhat sluggish flow between banks rather low, over which it flows in high water. At the northerly end of the village two rocky bluffs rise abruptly from beside the river. Along the south-eastern border of the township, the village reaching to it, a range of hills, the so-called Shawangunk mountains, in their course attaining elevations of one thousand

eight hundred feet, extend from the Delaware to the Hudson. Along the river bank between these terrestrial elevations the surface is quite flat for the distance of one-eighth of a mile; it then rises abruptly to a comparatively level area. Further back between the hills is a gently rising, undulating valley, down which the Neversink creek runs, passing through the lower end of the village to the river.

The village was early built on the rising ground back of the river; the building of the Erie railroad through it, however, drew it down over the level area, and this is now entirely built over, the business streets being here, and many residences, mainly of the laboring class; the better dwellings are on the higher ground, and usually have yards of considerable extent about them. The streets are generally macadamized, and are kept reasonably clean.

The Delaware and Hudson canal passes through the village at its northerly part, not far from the abrupt elevations already spoken of, and between it and these steep promontories, called Mt. William and Point Peter, is a portion of the village, much of it newly and well built, and locally designated as "Brooklyn." In an opposite direction, at the extreme southern part of the village, is another somewhat detached portion, called Carpenter's Point, near the river, and through this part of the village only the Neversink creek passes. A third section is one which lies in a flat lowland between the railroad and river, newly built and inhabited by a laboring class, very careless in their hygienic surroundings.

The geological formation, or nature of the soil, upon which the village stands is compact sand, covered by an alluvial surface soil. This sand is of very considerable depth, no clay sub-soil being reached, and is of uniform character. The wells, of which there are many, are quite uniformly about thirty-five or forty feet deep, being sunk into this sand. At some points so-called black sand is found ten or twelve feet beneath the surface, the color being probably of vegetable origin. In the higher portions of the village and generally up the Neversink valley a coarser drift is met with. Slate crops out occasionally, and this largely composes the mass of the inclosing hills. That the soil is very porous would appear to be evident, and in fact a resident physician informed me that his well always sunk a little when the water of the canal was drawn off at the end of the season, and rose when it was let in again in the spring, his residence being half

a mile distant from the canal. No similar fact was noted, however, of the wells generally. About the village there are no soil-saturated points, except in connection with one insignificant stream. This, arising apparently from a spring at a point near the center of the village, just at the termination of the flat area, courses slowly as an open stream along the foot of the rising ground, at places causing a somewhat marshy condition of its banks and then turns toward the river, being much of the way under cover. It receives some sewage material but was not notably offensive. Through another part of the village runs the bed — now dry, however — of a former streamlet, which has been abolished by its waters being held by a dam in the hills above to form the present reservoir for a village water supply.

The history of the village in point of salubrity is one of freedom from sickness to an average degree. Malarial disease has for a long time been met with throughout this vicinity. It has not, however, been of a severe form, and not even frequently seen as a well-marked quotidian or tertian, but more generally as an ill-defined fever with varying degree of periodicity. It has been called malarial, and very probably with sufficiently good reason. Diphtheria has been found to occasionally occur, but I did not learn that it had ever occurred epidemically and has never been severe, and no cases have been seen for a year. Sporadic cases of typhoid fever have usually occurred every fall. The health officer, Dr. Hardenbergh, tells me that in 1882 the disease was less prevalent than usual. He thinks that there generally occurred some ten or twelve cases in all. In the surrounding country there has been no special prevalence of typhoid fever, nor of any other disease. No similar epidemic to this one has ever occurred in the village.

The weather during the past season was characterized by light rains at frequent intervals during the early summer. It was very dry through the last six weeks of summer, and then in September there were several very heavy rain-falls. This sequence of events may have had some bearing on the outbreak of the epidemic.

The history and prominent characteristies of the epidemic which appeared in the locality thus described may very well be now noted. First, as to *time*. The epidemic, or endemic as it may very well be called, began about the first of October. My notes show half a dozen cases prior to this time, but I prefer to exclude them from the series for the reason that they are, I think, quite detached in origin

and time from the rest and have no relation to them. To dispose of these now, there occurred in August in one family three cases, one proving fatal; no other cases happened at this time, nor in this vicinity, and they were entirely due to the very bad and unsanitary condition of the premises. Four cases occurred also in September, of which three originated out of town and from causes, of course, disassociated with the rest and not allying them in any way to the general epidemic. Another case occurring in September was reported to me by the attending physician, which I did not see, and as no cause for the origin of the case was suggested, nor can be ascertained, I prefer to also pass it. Beginning then with September 28, there occurred from that time until the end of the year one hundred and forty-eight cases of what may be called well-marked enteric fever. A small number of cases have been reported as occurring since January 1, but the epidemic was practically suspended in the last week in November. There was, besides these one hundred and forty-eight cases, mention made of a considerable number of cases of mild fever, which were not regarded either by the attending physicians nor by me as true enteric fever.

In chronological order, one case was noted as taking onset on the 1st, 3d, 10th and 13th of October, respectively. On the 15th six cases have their onset placed; then on the 19th and 23d, each, there was one. These were only, however, the advance guard — the epidemic precipitated itself in full force on the 24th with the outbreak of four new cases, on the 25th there were seven, on the 26th nine on the 27th seven, on the 28th eleven, and thus it continued each day, bringing its quota of new cases during the space of three weeks, from October 24 until November 14. The onset of from five to ten new cases is noted for almost every one of these twenty-two days, few having less than this. Within this period one hundred and twenty-one cases arose. Prior to it thirteen cases originated and fourteen cases followed in the remaining six weeks of the year. The important feature of the outbreak is thus seen, and more graphically exhibited in the following table, that the most of the cases composing it arose within the limited period mentioned.

Table Showing Number of Cases Arising on Successive Days.

Date.	Number cases.	Date.	Number cases.
September 28	1	November 5	2
October 1	1	" 6	5
" 3	1	" 7	5

Date.	Number cases.	Date.	Number cases.
October 10	1	November 8	10
" 13	1	" 9	7
" 15	6	" 10	8
" 19	1	" 11	1
" 23	1	" 12	5
" 24	4	" 13	3
" 25	7	" 14	4
" 26	9	" 16	1
" 27	7	" 17	2
" 28	11	" 18	3
" 29	3	" 22	1
" 30	6	" 23	1
" 31	5	December 10	3
November 1	8	" 17	1
" 2	1	" 20	1
" 3	3	" 24	1
" 4	7		

Its onset was sudden and its suspension equally so. Allowing for a period of incubation there was practically an almost simultaneous occurrence of cases.

Next, the *locality* of the cases is an important feature in the study of the epidemic, thus suddenly precipitating itself. Here, it may be premised, as one fact of importance, that the epidemic was entirely limited to the village. In the country immediately surrounding there was no participation in it. In the considerable hamlet of Mattamoras, just across the Delaware in Pennsylvania and reached by a freely traveled bridge, there were a few cases but no more than ordinarily occurring.

It was strictly an endemic. In the village itself, however, this limitation ceases; the map which I had prepared, and upon which the locality of every case is noted, shows that they were scattered throughout its area generally. New cases made their appearance in all parts of the village at the same time. They were, however, more numerous in some parts than in others. I have made reference to a section of the village known as "Brooklyn," a well-built portion, on elevated, well-drained ground, lying northerly to the canal. Here many cases were found occurring; then crossing the canal, along the main residence street in the upper part of the village, cases occurred very thickly, making a broad belt from Brooklyn, southerly across the central portion of the village and descending to the lower town. It is observed that while it principally affected the better parts of the village, it reached portions the most varied in respect to salubrity and topography In the sections lying to the extreme southern and

northern limits of the village along the river and in a considerable area of the eastern part of the village there were hardly any cases

A third characteristic to be noted is the *plurality of cases occurring in respective households.* In about thirty families there occurred more than one case, five occurring in three families, four in four families, and in seven there were three cases. In three or four families every member was taken. In many cases the onset of all was within a few days of each other; in some they were consecutive to existing cases. The accompanying table (p. 16) will show this feature more perfectly.

In regard to *symptoms* characterizing the epidemic, the only one that may be noted as peculiar was marked abdominal pain at the onset; it was accompanied with nausea but not usually with looseness of the bowels. While by no means constant, this was noticed as very often present. In many there was the most ordinary sequence of common symptoms of enteric fever. Notes were not specially taken of symptoms present in all cases, but it was observed that the petechial eruption was very frequently present; hemorrhage from the bowels occurred in a number of cases and there were several cases of relapse. Ochre-colored stools were a symptom often found, but looseness of the bowels was not a marked symptom, nor was gurgling in the right iliac fossa. The symptoms I gathered largely from the attending physicians, for while I visited personally the majority of the families in which cases occurred, I did not do so at a time to find many of the sick in the acute stage of the disease. A fair proportion of the cases were mild in character. Sixteen deaths occurred in the one hundred and forty-eight cases, which would indicate severity of the epidemic as a whole.

As to the age of those attacked, the majority were young adults, although they were of all ages from two years to seventy-two, cases being noted at each of these extreme limits. Of one hundred and thirty-five cases in which the age was noted, ninety-six were above the age of fourteen and thirty-nine at and below that age.

In addressing myself to the inquiry as to the cause of this severe epidemic, these salient points thus noted were observed: The simultaneousness of the outbreak in a previously healthy locality; its sudden onset and sudden cessation; the limitation of it to the boundaries of the village; the distribution through the village to all of its various regions and to all classes of its inhabitants; the remarkable plurality of cases in individual households. The conclusion from these premises is inevitable that the epidemic as a whole pro-

ceeds from a common source of recent importation. In this connection it may be said that a cause was suggested for the epidemic by a lady residing in the village, that it was due to the milk supplied by one dairyman; her attention having been called to the fact that a number of those sick, within her observation, used this milk. This was further confirmed by the observation of two or three of the physicians of the village. The attention of the State Board was called to this prior to my visit. Accordingly this factor, along with other possible factors of causation, was made the subject of inquiry in the study entered upon by myself and the local health authorities and physicians. It may also be said here that the distribution of milk from this dairy was stopped by order of the village board of health on the 1st of November.

In looking for the causes of such an epidemic as this, there are, as Dr. Ballard remarks in a report upon the prevalence of enteric fever at Ascot, "four sources which are ordinarily looked to as those whence the contagium of the disease is most likely to have proceeded, and by the medium of which it may have been distributed, viz.: 1. A common source of water supply, such as some particular well or stream, or the mains of a system of public supply, in which case infection of the water, either at its source or in its progress for distribution, may result in the distribution with it of an infective material; 2. A common system of drainage, in which case a sewer becoming infected may be the means of distributing, through the medium of the sewer air, infective matter to the houses in relation with such sewer; 3. Where there is no common water supply and no common system of drainage to account for a wide distribution of fever, the cause for the spread may be found in the progressive infection of independent privies, etc., and by soakage from them into independent wells or other supplies of drinking water; or (4) the cause of the spread may be found in the distribution over the district of some particular article of food, such as milk which has become infected." Following up these well-recognized causes thus carefully formulated, I will briefly apply them to the case of Port Jervis.

The water was until within a recent time entirely from wells with which most of the premises were supplied. Water was pretty uniformly reached at a depth of about thirty feet. Ten years ago a public water supply was provided. The main reservoir is located about half a mile north of the village, and above in the hills. It is in a contracted valley, through which a small creek supplied by living

springs in the immediate neighborhood formerly ran, now cut off by a retaining dam. The entire circumference of the reservoir is smoothly stoned up, and as I found by personal inspection quite clean. The direct water-shed, of limited area, is uncultivated, but one field of growing crops being seen upon it. It is also practically uninhabited, there being no permanent dwellings upon it. There is another reservoir contributing to this at a higher elevation and said to be similar in condition. This public water is of unusually good quality, and could have had nothing to do with the production of the epidemic. In regard to the wells, while still largely used, especially in hot weather, they couldnot have caused such ageneral outbreak as we have here. Besides, well water was not used at all in many cases by those sick. But in view of the importance of the drinking water as a common cause for typhoid fever, and especially since in this porous soil there seemed to be every facility for the wells to become foul from closely contiguous privies and cess-pools, I paid especial attention to the possible bearing of the wells upon the epidemic. Clinical observation showed that if they had any bearing at all it was in the production of isolated cases only. I also procured samples of water from two wells in the thickly-settled part of the village, and they were analyzed by one of the public analysts of the State Board, Dr. Willis G. Tucker. When the surroundings of these wells is borne in mind, the result of this analysis and the unlooked-for degree of purity is very interesting. The analysis is as follows: the one marked "C" being from a dug-well in the central part of the well-built elevated part of the village, and was used by several families, among whom cases of fever existed. The other, marked "K," was from a driven well under the house in the lower town, twenty-five feet from both the cess-pool and well, in which a fatal case of typhoid fever had occurred. The water was collected early in January.

ANALYSIS OF WATER FROM TWO WELLS IN PORT JERVIS.

	Well marked "K."	Well marked "C."
Date when tested	January 15, 1884.	January 15, 1884.
Appearance in two foot rule	Clear, very slightly, bluish tint.	Clear, very slightly, greenish tint.
Smell when heated to 100° F	None	None.
Chlorine in chlorides	1.70	1.10.
Phosphoric acid in phosphates	None	Traces.
Nitrogen in nitrates and nitrites	.280	.428.
Free ammonia	.0021	.0092.
Albuminoid ammonia	.0024	.0040.
Oxygen absorbed 15 min'ts to 80° F.	.0136	.0408.
Oxygen absorbed 4 hours at 80° F.	.0326	.0707.
Hardness, equivalent to carbonate of lime Before boiling.	5.30	4.64.
Hardness, equivalent to carbonate of lime After boiling.	5.30	4.64.
Total solids, dried at 220° F	13.20	11.20.

Microscopic examination of the deposit showed in the well "K" "deposit very slight, no moving organisms;" of well "C" "mineral and vegetable debris and moving organisms including entomostracae." Dr. Tucker further remarks, regarding the "K" well—"the chlorine in this water is low; nitrogen in nitrates and nitrites, medium; free and albuminoid ammonia low. The amount of oxygen absorbed would rate this water according to Tidy as of great organic purity. Total solids low, as it is not a hard water. This water, judged by a chemical analysis alone, must be classed as a good water. Had an analysis been made in the fall the results might have been less satisfactory." Regarding the "C" well he remarks: "The chlorine in this water is low; nitrogen in nitrates and nitrites rather high; free ammonia high but albuminoid ammonia low. The oxygen absorbed would rank it according to Tidy as a water of medium purity. The water is quite soft and total solids low. Had the water been examined in the fall it might have given less satisfactory results and I should consider it on the whole an impure water and decidedly objectionable if there is a possibility of sewage contamination."

It thus appears that these wells, at least in the winter season, although in such questionable surroundings, are, as far as chemical analysis goes, sufficiently pure. It is not likely that the season would have much influence at the depth of a considerable number of feet below the surface, but of this I have no special observation.

The second general factor in the production of typhoid fever — a common system of drainage — is quickly disposed of, for although there is a general water supply there are no sewers; at least excepting a short line on one main street and a few instances in which several houses unite their waste pipes and carry them to the canal or waste-weir. Sewerage and sewer air has, however, its bearing on this study, and the method of disposal of waste calls for a mention. The universal custom is to discharge all house waste into yard cesspools. These are in no case water-tight and are never emptied, since the contents leech out of them and they usually keep at a low level; but in some few cases I was told that the sink water would fail to flow away for a time because the receptacle was over full. It was rarely the case that any attempt was made to ventilate them. Commonly there is only a connection through the kitchen sink, but a greater evil is the not infrequent introduction of water-closets into houses, since a public water supply has been provided, which empty

into these cess-pools. As far as observed, all sinks are located in the lower story only.

Most premises are provided with a yard privy. Their receptacles are usually superficial pits built of boards. A village ordinance prohibits emptying these during the summer months. Many of them are in an extremely unsanitary condition, besides being often very close to the house and not far from the well. Ashes and garbage are thrown at the back of the yard, along with house slops where there is no cess-pool, and are occasionally removed.

The third common source for spreading contagium is sufficiently referred to in speaking of the second as far as the facts are concerned. As to deductions from these facts, I have no hesitation in saying that the unsanitary conditions found respecting the cess-pools, privies and wells are a constant source of disease in this village, and am satisfied that some of the cases which occurred during these autumn months were due to these causes. The three cases spoken of as occurring in August, and not included in my reported list, were of this sort. There a filthy open cess-pool near the house received the waste from a water-closet on the second floor, besides other sinks. In other cases similar patent evils existed. But it is impossible to account for this sudden and disastrous epidemic as a whole by this or by either of the other factors. Having existed for years and no element entering wherein they differed from pre-existing conditions that was discoverable, it is impossible to believe that they could in one moment take on, alone or together, characteristics which would cause such sudden and widespread results. The same must be said of any larger and more general cause, such as the little sluggish stream spoken of in my preliminary account of the village, especially as no such cause existed commonly through the more prevalently affected regions, and cases of the disease were not common in the vicinity of any of them, a point which I will only say I made diligent inquiry concerning. No doubt the introduction of a public water supply without corresponding provision of sewers is an evil which should be considered, but bearing in mind the features of this outbreak, and the fact that ten years had elapsed since the introduction of the public supply, we are led to look further for the causes of the epidemic.

There remains then the question of spread of the infection by means of an article of food, and the only such article that needs a notice is the milk. The three cases that occurred in August were in the family of a butcher, and it was asked if his meat might not

have been the source of infection. It has been believed that meat hanging in front of butcher's stalls, by becoming covered with organic material in the dust from dirty streets, might be the cause of winter diarrhœa. But I am not aware of any careful observation of this, or that meat has been found the carrier of any disease germs. It would appear as if the process of curing and of cooking would destroy the vitality of any germs. But more than that in this instance there was no coincidence traced between this butcher's meat and the occurrence of this epidemic; it should be said, however, that this matter was not made the subject of careful inquiry.

About three miles north-east of Port Jervis, in the Neversink valley, is located the farm of a worthy lady, Mrs. Martha Cuddeback. It consists of three hundred and sixty-five acres of smooth, arable, rolling land, in good condition. Twelve cows are kept, and their milk sold in Port Jervis. They are kept at pasture and are all healthy. The buildings consist of a dwelling, with out-buildings in a capacious yard, at the rear of which runs the track of the Port Jervis and Monticello railroad, while on the opposite side of the highway is the barn and cow stables, to the yard of which the cows are brought to be milked. This barn is two hundred feet from the house. The privy, of the common sort prevailing in the country, is one hundred feet from a rear wing of the house, on the opposite side of which is the well one hundred and twenty feet from the privy. There are no drains or house sinks, slops being thrown on the ground near. The entire premises are upon a level plateau, the soil of which is a surface layer of arable soil upon a sub-soil of firm sand, silt and gravel. The entire premises were in a cleanly, sanitary state. It is perhaps a quarter of a mile to the nearest neighbor. The family consists of Mrs. C., a widow, and her three or four adult children, by whom most of the work of the place is ordinarily done.

Typhoid fever developed in this family in August, 1883, one of the sons and the only daughter being taken sick within a few days of each other, about the first of the month. A second son became sick about the last of September. These cases ran an ordinary course, were attended with the common symptoms, and recovery followed after several weeks' duration. At the time of my visit in November, the last one sick was still confined to his bed. The origin of the disease upon the farm I did not discover. During the previous summer a case occurred in the family of a neighbor, but there was no history of communication.

The accompanying plan shows the relation of the various buildings and related features.

It will be seen that the plan of the house shows four principal rooms, all communicating. The one chiefly occupied by the sick is the south-west room. This opens directly into a sitting or family room, and also into a kitchen, which is in the wing to the rear of the house. The doors between these rooms were seldom closed. The care of the sick was largely in the hands of the other members of the family, and although a hired nurse was employed part of the time, all were in more or less free contact with affected members. The excreta from the sick were, as a rule, disinfected with sulphate of iron, and deposited in a shallow trench in sandy soil to the rear of the house and seventy-six feet from the well, the location of which is shown in the cut. Cold baths were used in the treatment of the sick, and the water was emptied at the point noted, fifty-five feet from the well; the ground, however, is sloppy much nearer the well from this water or from house slops. The family linen was hung out after washing near where the water was emptied.

The habitual custom in regard to the milk is the following: The cows are brought to the barn yard and there milked; this work and the handling of the milk being done by the members of the family. It is then taken directly to a milk-house. This milk-house is a rude structure to the rear of the barn, eight hundred feet distant, at the foot of a precipitous descent at the edge of the level plateau, and twenty feet below its surface. In a spring, which it incloses, the milk is set in ordinary milk cans. Here it is left until called for by the milkman to whom it is sold for distribution. The milk has always borne a high reputation among its consumers. The empty cans are returned to the dairy and are taken to the house where they are washed. During the warm weather of summer this washing is done outside the kitchen door on the platform shown in the cut. It is done by the members of the household, the process consisting in scrubbing them with soap and water, after which they are rinsed with boiling water; they are finally rubbed out with dry cloths. The cloths used are generally left hanging outside, but are not infrequently brought into the kitchen, and as the weather gets colder or is stormy the entire process is gone through with in the house. The cans remain about the house until used at milking time. The water used is from the well. It is seen that at least ordinarily scrupulous care is used in the handling of this milk. Nevertheless there are clearly three ways open for its infection: (1) By the infection of the well water from the excreta deposited not far away or from the bath

water; (2) By the infection of the cans directly from the air or through the cloths used in the process of washing; (3) By the infection of the milk through the medium of those drawing and handling it, who go directly to it from the proximity to the sick. As to the first, there was every facility for the well to become infected. When it is recalled what I have said about the weather, it may readily be conceived that during the dry season of summer the water would remain pure. About the first of September, however, several severe storms occurred, and in this soil it could hardly fail to carry these ripe germs to it, for the disinfection could not have been sufficient to destroy them. The cleaning of the well, which was done in the early summer, would of course have no saving virtue. As to the use of the water beyond the purpose of washing, no inquiry was pressed, but it is very possible that none of it ever found its way into the milk directly. It was used, however, to wash the cans.

As to the second means, there is little need to dilate, as it is known to those familiar with this subject that the wash cloths hanging in proximity to the sick would readily take up germs from the infected air, and these could easily be left on the vessel when coming in contract with it, especially the dry one last used in wiping it out. This particular method of infection of the milk by means of infecting the cans is well recognized by sanitary investigators. In this case not only the wash cloths, but also the clothing of those using them might have been carriers of the germs; besides this the cans themselves may have taken the germs directly from the air in which they floated. When we recall that in cold or stormy weather they were brought into the kitchen, the air of which was practically that of the sick room, that all the utensils were exposed then more especially to this air, and that these added facilities of infection coincided with a period a little antedating the commencement of the outbreak in the village, we have every ground to believe that this, together with the first means, furnished a reasonable means of infection of the cans and milk. The third method spoken of has its possibilities, in the presence of which alone no one would venture to exculpate the milk from danger of infection. It is not so easy, however, to specify its operation here as the two other causes noted.

Following now the milk after leaving the farm, we find that it is taken thence daily by the milkman, Mr. Hensell. The amount furnished to him was eighty quarts, and this constituted two-thirds of the entire quantity used by him and distributed through the village. Taken in the cans into which it was put on being drawn it

was kept in and distributed from them by the milkman. He took it from the milk-house to his own residence in the outskirts of the village, and placed it in a milk-house in spring water until next morning when it was distributed. I am indebted to Dr. J. H. Hunt, of Port Jervis, for much assistance in collecting the facts collated in this report, and among the rest is the entire list of the patrons of this milkman and the number of persons in each family. From this list it appears that one hundred and thirty families took the milk, and about five hundred individuals. This is a large number to be supplied with one hundred and twenty quarts of milk, but it is to be noted that many families for various reasons took part of their milk from other milk venders. It is quite probable also that some of them were not habitual customers. Mr. Hensell told me that he supplied one hundred and twenty-five families regularly. As to the line of his route — starting from his residence — at the outskirts of the village, supplying several of his neighbors, he proceeds down Kingston avenue near which he lived, and thence over into "Brooklyn," where he had many customers; thence he came down into the main part of the village, finally ending his route on the principal streets of the busy part of town. The outline of his route is very well shown by the locality of the cases of fever as they are marked on the map, those using his milk being designated. It is observed that his route did not include Carpenter's Point, nor the north-western section of the village.

Of the one hundred and forty-eight cases which form the subject of this study, one hundred and twenty-eight took this milk. These are designated on the map by marks which distinguish them from other cases. These cases occurred in sixty-four families. It is seen that typhoid fever occurred, therefore, in one-half of the families that were supplied with this milk.

Further, it has been observed that of his one hundred and twenty quarts of milk, forty quarts were from another source than the Cuddeback dairy. It was the habitual custom to keep the milk separate and to serve it from the cans in which it was put at the dairy. I was informed by Mr. Hensell that not only this was his custom, but also, that he always dealt from the Cuddeback milk cans first. Consequently this fell to the lot, especially of the residents of the Brooklyn neighborhood. Here the cases occur most numerously, few families escaping infection. As the bottom of the can was reached, however, its remaining contents became mixed with the

next, so that the other milk was likewise infected, though in a dilute form.

It is seen that but five hundred of the nine thousand inhabitants of this village regularly used this milk; there were ten or twelve other milk venders, several selling much more milk than this one. But of the entire number of one hundred and forty-eight cases of typhoid fever there were but twenty-two in which this element of alleged causation failed to be traced, through the combination of ascertained facts from my personal inquiry, the testimony of the attending physicians and the report of the milkman. The causes of certain of these were traced elsewhere, but it is quite probable, though not proven, that some of them at some time used this milk, possibly unconsciously, by their milkman having replenished his stock from this milk, by borrowing of a neighbor or in other ways that readily occur.

TABLE of Statistics of the Enteric Fever Epidemic at Port Jervis, in chronological order, of the first case in the family.

	Date of attack.	Number in family.	Number sick.	Ages.	Deaths.	Water used.	Distance of well from privy.	Water-closet in house.	House drains to cess-pool.	Drains trapped.	Suspected milk used.	Remarks.
1	Sept. 28	.. .	3	30	....	Public	..... .	No.	Yes.	Yes.	Yes.	
	Oct. 25	. ..	....	30	....	....	... .	.....	.....	. .....	Yes.	
	Nov. 4	....	...	20	....	..... .	... ...	....	.....	.....	Yes.	
2	Oct. 1	....	2	7	1	Public.....	....	No.	Yes.	Yes.	Yes.	
	Nov. 14	...	....	30	....	.. ..	.....	....	.....	.....	Yes.	
3	Oct. 3	....	1	.. ..	....	Public and well	... .	....	Yes.	.....	No.	Onset out of town.
4	Oct. 10	6	1	51	1	Well‡	25 feet ...	No.	Yes.	Yes.	No.	‡See Dr. Tucker's analysis, well "K."
5	Oct. 13	2	1	67	....	Well	55 feet....	No.	No.	.....	No.	
6	Oct. 15	...	5	adults	..	Public	....	Yes.	Yes.	Yes.	Yes.	One of these cases began about October 1.
7	Oct. 15	....	1	35	....	Well	60 feet....	No.	No.	.....	Yes.	
8	Oct. 19	....	1	37	.. .	Public..... ..	40 feet....	Yes.	Yes.	Yes.	Yes.	
9	Oct. 23	5	1	30	....	Well	.....	No.	No.	.....	Yes.	
10	Oct. 24	5	2	2	....	Public	.....	No.	No.	.....	Yes.	
	Nov. 9	...	....	8	...	.....	.....	.....	.....	.....	Yes.	
11	Oct. 24	7	4	6	1	Public	....	No.	Yes.	.....	Yes.	
	Oct. 26	...	...	20	....	.....	.....	.....	.....	.....	Yes.	
	Nov. 1	....	...	30	....	.....	.....	.....	.. ...	.....	Yes.	
	Nov. 10	....	.. .	24	...	.....	.....	.....	.....	.....	Yes.	
12	Oct. 24	6	1	20	....	Public and well	30 feet	No.	Yes.	Yes.	Yes.	Good sanitary condition.
13	Oct. 24	5	4	18	1	Public	.....	No.	No.	.....	Yes.	
	Dec. 10	....	....	55	...	....	.....	.....	.....	.....	Yes.	
	Dec. 10	...	....	22	....	.....	.....	.....	.....	... ..	Yes.	
	Dec. 10	...	...	19	....	... ...	.....	.....	.....	.....	Yes.	
14	Oct. 25	3	2	9	....	Well	90 feet....	No.	Yes.	.....	Yes.	
	Oct. 31	...	...	22	1	.....	.....	.....	....	.....	Yes.	
15	Oct. 25	....	3	5to10	....	Well	40 feet....	No.	.....	.....	Yes.	
16	Oct. 25	....	2	22	...	Public.....	No well..	No.	Yes.	Yes.	Yes.	
	Nov. 7	....	....	18	1	.....	.....	.....	.....	.....	Yes.	
17	Oct. 25	....	1	20	...	Well	130 feet...	No.	.....	. .....	Yes.	
18	Oct. 26	..	5	4	....	Public and well	75 feet....	No.	Yes.	.....	Yes.	
	Oct. 26	....	. ..	8	....	.....	.....	.....	.....	....	Yes.	
	Oct. 26	....	....	43	....	.....	.....	.....	.. ....	.....	Yes.	
	Nov. 9	....	....	12	....	.....	.....	.....	.....	.... ..	Yes.	
	Nov. 10	....	....	25	...	.....	.....	.....	.. ....	... .	Yes.	
19	Oct. 26	....	5	16	1	Public.....	No well...	No.	Yes.	No.	Yes.	
	Oct. 26	....	. ..	14	....	....	....	..... .	.....	.....	Yes	
	Nov. 8	.. .	....	7	....	.....	....	....	.....	....	Yes.	
	Nov. 8	....	....	50	....	... .	.....	.....	.... . .	.. ....	Yes.	

	Nov.	9	....	....	14	....	.....	.....	.....	.....	.....	Yes.	
20	Oct.	26	....	1	12	....	Public and well	60 feet....	No.	Yes.	Yes.	Yes.	
21	Oct.	26	....	2	32	....	Public.....	30 feet ..	No.	Yes.	Yes.	Yes.	
	Oct.	26	....	....	1½	....	.....	.....	.....	.....	.....	Yes.	
22	Oct.	27	....	1	57	1	Public.....	. ...	No.	Yes.	. .....	Yes.	
23	Oct.	27	....	1	7	...	Public.....	....	Yes.	Yes.	.....	Yes.	
24	Oct.	27	....	4	50	....	Public.....	No well..	Yes.	Yes.	Yes.	Yes.	
	Oct.	27	....	....	25	....	... .	.....	.... ..	.....	... .	Yes.	
	Oct.	27	...	...	20	..	.....	.....	....	....	. .....	Yes.	
	Oct.	27	....	....	3	...	.....	.....	.....	.....	.....	Yes.	
25	Oct.	27	....	1	adult	1	.....	.....	.....	.....	.....	Yes.	Removed from village in course of sickness.
26	Oct.	28	....	2	45&28	....	Public	None.....	No.	.. ....	.....	Yes.	
27	Oct.	28	....	2	50	....	Public.....	None. ..	No.	Yes.	No.	Yes.	
	Nov.	8	....	...	9	....	... .	.....	.....	.....	... ...	Yes.	
28	Oct.	28	....	1	6	...	Public..... ...	.....	Yes.	Yes.	Yes.	Yes.	
29	Oct.	28	...	2	adults	...	....	. .....	.....	.....	.....	Yes.	
30	Oct.	28	4	3	†	....	.....	.....	.....	.....	.....	Yes.	† Adult and two children.
31	Oct.	28	...	1	30	1	Public	None.....	No.	Yes.	.....	Yes.	
32	Oct.	28	4	1	8	....	Public..... ..	None.....	No.	Yes.	No.	No.	An old well used as cess-pool in bad condition [—air enters house.
33	Oct.	29	....	4	72	1	Public.....	None.....	No.	No.	... .	Yes.	
	Nov.	1	...	....	35	....	... .	.....	.....	... .	....	Yes.	
	Nov.	3	..	...	28	....	....	... .	....	.....	.....	Yes.	
	Nov.	4	....	....	22	....	.....	.....	.....	.. ....	.....	Yes.	
34	Oct.	29	....	1	35	...	Public	None.....	.....	Yes.	Yes.	Yes.	
35	Oct.	29	6	2	8	...	Well..... ...	100 feet...	No.	Yes.	Yes.	Yes.	
	Nov.	7	....	....	40	....	.....	.....	.....	.....	.....	Yes.	
36	Oct.	30	2	1	25	....	Well.....	30 feet....	No.	Yes.	Yes.	Yes.	
37	Oct.	30	...	1	11	....	Public.....	....	No.	Yes.	No.	No.	No cause traced for this case.
38	Oct.	30	....	1	22	....	.. ..	....	.....	.. ....	....	Yes.	
39	Oct.	30	....	1	35	....	Well.....	85 feet....	No.	Yes.	No.	Yes.	
40	Oct.	30	....	1	45	....	Well and public	30 feet....	No.	Yes.	Yes.	No.	Mild fever, some doubt of diagnosis.
41	Oct.	30	..	3	40	1	Well	25 feet....	No.	... .	... .	Yes.	
	Oct.	31	..	....	10	....	....	. .....	.....	....	.....	Yes.	
	Oct.	31	. .	....	8	....	.....	.....	.....	... .	.... ..	Yes.	‡ See Dr. Tucker's analysis "well C."
42	Oct.	31	3	1	17	....	‡Public and well	25 feet ...	Yes.	Yes.	Yes.	No.	Cess-pool unventilated and near house.
43	Oct.	31	....	3	20	....	Cistern	None	No.	No.	.....	Yes.	
	Nov.	10	...	...	18	....	....	.....	.....	.. ....	... .	Yes.	
	Nov.	10		....	45	....	.....	. .....	....	....	... .	Yes.	
44	Nov.	1	5	3	28,25,5	....	Public.....	None.....	No.	No.	.. ....	Yes.	
45	Nov.	1	....	3	56	1	Public.....	50 feet...	No.	Yes.	Yes.	Yes.	
	Nov.	1	....	....	50	...	.....	.....	.....	.... ..	.....	Yes.	
	Nov.	11	....	....	8	....	....	.....	.....	.. ....	... .	Yes.	
46	Nov.	1	3	2	5	....	Well.....	45 feet...	No.	.....	.....	No.	
	Nov.	10	...	. ..	7	....	....	.....	.....	....	.....	No.	
47	Nov.	2	. ..	2	35	....	Public.....	None.....	No.	No.	.....	Yes.	
	Nov.	9	.	....	8	....	.....	.....	.....	.....	..... .	Yes.	
48	Nov.	3	....	2	24 2	. .	Public....	50 feet....	No.	No.	.....	Yes.	
49	Nov.	4	....	1	40	. ..	Public and well	40 feet....	No.	....	....	Yes.	
50	Nov.	4	....	1	5	...	Public...	. .....	No.	Yes.	.....	Yes.	
51	Nov.	4	....	1	40	....	Public	None.....	No.	Yes.	No.	Yes.	

TABLE—(*Continued*).

	Date of attack.	Number in family.	Number sick.	Ages.	Deaths.	Water used.	Distance of well from privy.	Water-closet in house.	House drains to cess-pool.	Drains trapped.	Suspected milk used.	Remarks.
52	Nov. 4	....	1	25	....	Well	25 feet	No.	No.	....	Yes.	
53	Nov. 4	8	1	....	1	Well	40 feet	No.	No.	....	Yes.	
54	Nov. 5	....	1	5	....	Well	75 feet	No.	Yes.	....	Yes.	
55	Nov. 5	....	1	18	....	Well	60 feet	No.	....	....	Yes.	
56	Nov. 6	....	3	29,26,2	....	Public and well	20 feet	No.	Yes.	Yes.	Yes.	
57	Nov. 6	5	2	30	1	Public	None	No.	Yes.	Yes.	Yes.	
	Nov. 12	....	....	19	....	Well	....	....	....	....	Yes.	
58	Nov. 6	4	1	....	....	Well	12 feet	No.	Yes.	Yes.	Yes.	
59	Nov. 7	2	1	....	....	Public	None	No.	Yes.	No.	Yes.	
60	Nov. 7	....	1	....	....	....	....	....	....	....	Yes.	
61	Nov. 7	6	1	....	....	Well	75 feet	No.	....	....	No.	
62	Nov. 8	8	2	....	....	Well	40 feet	No.	....	....	Yes.	
	Nov. 8	....	....	....	....	....	....	....	....	....	Yes.	
63	Nov. 8	....	1	25	....	Public	....	No.	....	....	Yes.	
64	Nov. 8	....	2	30,10	....	Public and well	75 feet	No.	Yes.	....	Yes.	
65	Nov. 8	....	1	7	....	Public	....	No	Yes.	....	Yes.	
66	Nov. 8	....	1	20	....	Public	....	No.	....	....	Yes.	
67	Nov. 9	....	1	35	....	Public and well	30 feet	No.	Yes.	Yes.	Yes.	
68	Nov. 9	....	1	39	....	Public	None	....	No.	....	Yes.	
69	Nov. 9	4	2	6	....	Public	40 feet	No.	Yes.	Yes.	Yes.	
	Nov. 13	....	....	25	....	....	....	....	....	....	Yes.	
70	Nov. 10	....	1	30	....	Public	....	No.	....	....	Yes.	
71	Nov. 10	....	1	30	....	Public	None	No.	None.	....	No.	
72	Nov. 10	....	1	9	....	Public	....	No.	....	....	No.	
73	Nov. 12	....	1	40	....	Public	....	No.	Yes.	....	Yes.	
74	Nov. 12	....	1	12	....	Public	None	No.	Yes.	Yes.	Yes.	
75	Nov. 12	....	1	45	....	Public	....	No.	No.	....	Yes.	
76	Nov. 12	3	1	....	....	Public	....	No.	....	....	No.	
77	Nov. 13	....	1	19	....	Public and well	400 feet	No.	No.	....	Yes.	
78	Nov. 13	....	1	8	....	Well	....	No.	....	....	Yes.	
79	Nov. 14	....	1	22	....	Public	....	No.	No.	....	No.	
80	Nov. 14	....	1	8	....	Public	None	No.	Yes.	Yes.	Yes.	
81	Nov. 14	....	1	6	....	Public	35 feet	Yes.	Yes.	Yes.	Yes.	
82	Nov. 16	....	1	18	....	Public	40 feet	No.	Yes.	Yes.	No.	
83	Nov. 17	....	2	19	....	Public	....	No.	No.	....	No.	First case taken sick out of town.
	Dec. 24	40	....	....	....	....	....	....	....	....	No.	

84	Nov.	17	6	1	....	....	Well	30 feet. .	No.	No.	.... .	No.	
85	Nov.	18	...	1	22	....	Public	. .. .	No.	No.	.....	Yes.	
86	Nov.	18	.. .	1	30	1	Public.....	.....	No.	No.	... .	Yes.	
87	Nov.	18		1	40	....	Well	50 feet...	No.	.....	.....	No.	
88	Nov.	22	...	1	25	....	Public.....	....	No.	Yes.	No	Yes.	
89	Nov.	23	....	1	14	...	Well	30 feet...	No.	Yes.	.....	No.	Secondary to case No. 36.
90	Dec.	17	....	1	17	...	Public	....	No.	Yes.	No.	No.	
91	Dec.	20	2	1	....	....	Well	30 feet...	No.	No.	.....	No.	

It is proper to make some further reference to the twenty-two cases not traced clearly to milk infection before going further. Reference to the foregoing table will show that they occurred at various times during the fall. In cases numbered 3 and 83 the cause may be traced to out-of-town origin. The first was taken sick at the village of Strausburgh early in October, and returned to Port Jervis where he was sick. In the latter family likewise in which there were two sick, one returned to this village after a considerable absence with his disease in progress, and the other was taken, secondary, some weeks later. These need no further reference. Four or five cases were more or less clearly secondary to other cases. This was notably traced in case numbered 89 of the table. Here a young girl was taken sick November 23, the only one taken of a family of three persons. The attack was a quite mild one. In the house adjacent case number 36 had been sick since October 30. The privies of these two houses were directly contiguous, and excretions from the sick were thrown into the vault. In cases 72 and 46 there were other cases of the disease in the same house, but in another family. The chances for infection were the same. In case 87 there was a like vicinage to other cases; I did not personally visit either of these last two cases. Local unsanitary conditions sufficient to account for the disease existed in numbers 32, 37, 42, 82 and 90. The first of these was in a family of refinement with cleanly surroundings. It was found, however, that a deep well, but a few feet from the sitting-room windows, had been turned into a cess-pool; the air from this was so foul sometimes as to necessitate keeping the windows closed. A house sink, trapped, emptied into this; but a small water motor had been introduced, and the waste pipe from this tapped the one from the sink *below* the trap, thus giving direct access of this cess-pool air to the house. In another case a bath-tub and water-closet had been introduced into the house, and wasted into a cess-pool which was directly under the windows of the sleeping-room of the young man who was taken sick. In the other cases, in poorer families, there were no traps to drains which emptied into cess-pool. Their bad sanitary condition is the only cause to which I can attribute the rise of these cases. In nine or ten of these cases well water was used. How much of a factor this was is quite problematical. Reference to the report of Dr. Tucker's analysis of well water here will show that the water seems remarkably free from organic impurity. Well "K," that of case 4 of my table, was a driven well, under the house, only twenty-five feet

from the privy, and twelve feet from the cess-pool into which the kitchen water ran through a trapped pipe. The premises were cleanly, and the house in a good-sized yard, and occupied by one family, a single member of which was taken sick fatally. Her symptoms were those of abrupt onset with high temperature and abdominal pains which so commonly characterized the epidemic. The other well, which was selected as typical of the well waters of the higher portion of the village, was used by several families of the better class. Fever was not specially prevalent among them; it was used by case 42, which was, however, I think traceable to cess-pool air. It is reported by Dr. Tucker as not good water, but still not bad enough to condemn as unfit for use. These wells were samples fairly of the well water of Port Jervis. It is extraordinary that they are apparently so pure. While on general principle it may be safe to say that such water is not safe to use, and probably every year are a cause of typhoid fever, and probably acted as in former years during this epidemic, causing very likely some of the cases alluded to, yet there could not be discovered any distinct proof of this. Taking out of the twenty-two cases, two originating out of town, and five that were apparently secondary, there remain fifteen cases for which no more definite cause can be assigned than lie in local unsanitary conditions. I am still further at a loss to report explicitly upon them, as most of them were reported to me only after my visit there. They do not, however, throw light upon any common cause that would probably act to produce the general epidemic.

Conclusions.— To sum up the facts ascertained after study of the case in all its bearings: the epidemic was one of true enteric fever; it made its appearance in a previously healthy locality; it arose suddenly and ended suddenly; it was limited to the village; it exhibited no local foci of infection; it affected several members of a large proportion of the affected families; eighty-seven per cent of the cases occurred among persons using the milk supplied by one milk vender; one-half of the families using this milk were taken with the disease; the persons using the milk constituted but five per cent of the entire population; but two-thirds of the milk supplied by this vender was from a suspected source; the possibility of the milk becoming infected from the cases of the disease at the dairy farm is established; there was no cause affecting the subjects of the disease in common except the use of this milk.

I would report, therefore, that the epidemic was caused and spread through the medium of infected milk. This cause for the spread

of at least three of the zymotic diseases (typhoid fever, scarlatina and diphtheria) has become a recognized fact since about ten years ago. Observation of it has, however, been for the most part limited to Great Britain; no such well-marked instance as this of Port Jervis has been reported in this country. It became established through the energetic and thorough investigation of sanitary officers connected with the British boards of health, one of whom I have quoted in this report, and whose study leaves no doubt of the possibility of this factor in the ætiology of the disease. Mr. Ernest Hart, of London, reported to the International Medical Congress in 1881 the abstracts of seventy-three reported epidemics traced to this cause. In the epidemics from seventy-three to one hundred per cent of the cases were traced to this direct source; in some of them there were cases of the disease at the dairy, while in others there were only bad sanitary conditions; some were of limited duration and others extended over several years, notably that of Dr. Ballard at Ascot, which may be found in extended detail in the "Report of the medical officer of the local government board" for 1877. No fact is better established than that milk may become a carrier of infection. As to how the poison reaches the milk, there are many possible ways. In twenty-two of these epidemics it is recorded as occurring by washing the cans with well water into which the specific poison has soaked; in others the cans were often taken into the house while the disease was present in it to be washed and dried; or the operations of the dairy were performed by those attending the sick; or infected linen was hung near the cans. As to the escape from the disease of a considerable proportion of those using the milk Mr. Hart suggests that "disease germs are in all probability particulate in their nature and not diffused equally through the whole mass of the milk;" and I may add that it is also true individuals do not possess equal susceptibility to infection from whatever source. I dwell thus at length upon this point because it should be generally known that this source of typhoid and other diseases is established, and should be considered by dairy men and all those engaged in distributing this common article of food.

Recommendations. — Although, in my opinion, the cause of this epidemic lay in the milk, and ceased long ago to be operative, yet I would suggest that certain precautions are still necessary. As to the focus of infection itself, on my recommendation, the house was thoroughly disinfected, fomites cleaned or destroyed, a quantity of sulphate of iron distributed over the infected soil, and a crate of

the same suspended in the well, thus precluding its further use, another, more remote, being substituted for it. But there can be no question that throughout the village in privy vaults, soil and cess-pools there are abundant typhoid germs which, possessing vitality for several years, as is known, present cause for alarm regarding the future of this village. It should not be overlooked, moreover, that an abundant water supply without corresponding sewerage is an evil as it makes the soil saturation with decomposing waste very certain. The very fact of a public supply makes the wells the more likely to become foul, and how these avoid being much purer than the cess-pools themselves in this porous soil is difficult to imagine. As to the evils of the cess-pool system in a large village, especially as they are becoming there more and more the receptacles of water-closet discharges, it is not necessary to refer. It seems to me that there is nothing to be anticipated for the salubrity of this village except to stop the use of well water and to disinfect and fill up the cess-pools, which latter I believe to be the greater evil of the two there. To do this makes necessary the provision of another avenue for the disposal of waste from the houses, and there is none other than the construction of sewers. Of the details of this others are more competent to speak than I can, but I see no costly obstacle in the way of carrying out the separate system of sewerage now so generally recommended for villages of this sort. It appears well adapted for a thorough system of drainage. Many of the dwellings are already provided with water and waste-pipes. Without this Port Jervis cannot fail to become unhealthy; with it and with suitable attention likewise to the drainage of the soil, and with their unexceptionable supply of pure water it may easily be one of the most salubrious villages in the State.

Respectfully submitted,

F. C. CURTIS.

THE PROXIMATE CAUSE OF MALARIAL DISEASE.

By Alfred L. Carroll, M. D., Medical Investigator.

To the State Board of Health of New York :

In October, 1881, Dr. Harris requested me to plan a line of research into the ætiology and pathogeny of endemic diseases, with more especial reference to continued and complex forms than to "fever and ague," and to determine, if possible, "what part excremental filth plays in the production of continued or anomalous paroxysmal fevers." Shortly afterward, he added to the list of my inquiries "a systematic study of malaria" in the maritime district, with the view of discovering not only the conditions — telluric, atmospheric, domiciliary, or personal — under which it arises, but its essential, specific cause, if such there be. A work of this sort, involving almost every branch of natural science, and entailing further explorations of *the intricacies of the "Germ Theory,"* is a difficult and tedious task, requiring the co-operation of skilled observers in various departments; and the few facts thus far ascertained lead merely to the suggestion of certain clues which may, or may not, serve as guides to more positive results. A few brief reports of superficial examinations in specified instances, referred to me by Dr. Harris, have been given where immediate action was required; but these contained little of scientific interest, and the most important part of the problem is still to be solved.

As regards the first subject of inquiry, I can only say at present that numerous observations, though far short of exact demonstration, have strengthened a belief that excremental filth in certain stages of decomposition, and under circumstances not yet defined, may not only intensify, but even originate, specific infectious diseases (such as enteric fever and diphtheria in particular), and that most of the cases of anomalous paroxysmal fevers, commonly reported under the heading of "typho-malarial," owe their complex features to superadded filth-poisoning. Various recent experiments have seemed to lend color to the view that micro-organisms, supposed to be the causative factors in several infections, may gain or lose in virulence through propagation in different media. As illustrations of the extremes of this proposition, may be mentioned, on the one hand, the alleged transformation of the common "hay bacillus" into a germ of poisonous character, by changing its environment; and, on the other hand, the attenuation of virus as practiced by Pasteur and his followers. These, and many intermediate experiences, considered in connection with the well-known capacity of the lower forms of life to adapt themselves to altered conditions of existence, have lately induced Dr. W. B. Carpenter, one of the ablest biologists of the world, to state the doctrine that the same germs, undergoing development under different conditions, may manifest themselves under a variety of forms, and give rise to different diseases; going even so far as to opine that, under favoring circumstances, an ordinary malarial fever may develop into a virulent, highly contagious form. In view of the many and almost insuperable sources of error in micro-experimentation, it is impossible as yet to remove such questions from the realm of hypothesis, and much careful work, with improved methods, will be required to substantiate or disprove what is now mere surmise.

The Proximate Cause of "Malarial" Disease

Is equally beyond our present knowledge, although most observers are agreed as to the conditions which favor its development, chief among which is the decomposition of vegetable matter, fostered by warmth and moisture. Such vegetable matter may be in minute subdivision in the soil, or in mass upon the surface. In the oft-quoted example of the marine hospital at Swinemünde, a strictly localized outbreak of paroxysmal fever was traced to its source in a rain-water cask, partially filled with decaying leaves; Drs. Holden and Bell have each ascribed the occurrence of malarial attacks on shipboard to the profuse growth of mould upon ill-kept provisions; and I have, in several instances, found dense fungus vegetation in surprisingly large quantity upon the beams and under the basement flooring of houses wherein intermittent or remittent fever had prevailed, the external conditions being salubrious, and the neighborhood apparently free from malaria. Whether the rapid growth and decomposition of these short-lived organisms exerts any special influence, and whether the appearance of malarial fevers in regions previously exempt, may depend upon cumulative development and decay of cryptogamic parasites, superimposed upon grosser vegetable decomposition, is a matter for further investigation.

Although the conjoined conditions of decaying vegetation, moisture, and (in malarial seasons) favoring temperature, are found most typically in swamps or marshy lands — whence the term "paludal" miasm — they may be, and often are, artificially established, as in the case of obstruction to natural drainage descents, saturation of the surrounding soil with house-refuse, or damp cellars giving rise to exhalations of their own or permitting the influx of the polluted ground atmosphere. In very many instances I have been convinced that such faulty domiciliary factors were alone concerned in the production of malarial fever.

An apparent exception to the above-defined rule is sometimes cited in the existence of malaria upon sandy or gravelly soils; but in such instances the siliceous particles have been found coated with cryptogamic vegetation, and under-laid by a water-retaining stratum, evaporation from which furnishes the requisite moisture for fermentation. It is, at all events, a statistically established fact that properly conducted deep drainage is effective in diminishing and ultimately abolishing malarial disorders.

In addition to external circumstances, we have also to consider a varying factor of personal susceptibility. Many even slight disturbances of the system may temporarily lessen the vital power of resistance to morbific influences; but in the case of malarial poisoning, common experience seems to indicate a rapid lowering of the bodily surface temperature as the most perfect agency of this sort. As a rule, the "malarial" character of soils is in inverse ratio to their capacity for retaining the heat which they absorb from the sun; paludal fevers prevail more in spring and autumn, when there is a greater difference between day and night temperature, than in summer when fermentative processes are more active; and professional observation confirms the popular tradition touching the peculiar peril of

the early morning and after-sunset hours in malarial districts and seasons. So uniform has been the result of observation in this respect that Dr. Oldham, an eminent British physician, has insisted upon the efficiency of bodily "chill" alone — irrespective of any specific telluric or atmospheric conditions — to induce intermittent fever. The consensus of scientific opinion, however, is in opposition to this view, and the pathogenic properties of certain localities have been recognized since the time of Hippocrates, who, in his treatise on "Airs, Waters and Places," noted the prevalence of quartan fevers and enlarged spleens in marshy regions.

The search for a specific *tertium quid* or actual causative agent, evolved under the foregoing conditions, has elicited diverse theories. Various gaseous products — notably cyanogen compounds — have been supposed to constitute the essential toxic element, but their claims have not been substantiated by experiment. When it was noticed that the malarial poison was seemingly heavier than atmospheric air, capable of being carried by ærial currents to considerable distances, and arrested by material barriers, such as screens of foliage, there was a strong temptation to regard it as particulate, and an assumed similarity between its action and the process of fermentation led to the inference that its particles were organized. The earliest argument of the cryptogamous origin of malarious fevers which I know of (and this only by repute) was that of Dr. Mitchell, published thirty-five years ago. Seventeen years afterward some notoriety was obtained by Dr. Salisbury's alleged discovery of the *causa vera* in an organism which he called the "palmella gemiasma" and which was asserted to have conveyed the malady, in a small flower-pot, to a very long distance from its original home. During the following year I found an apparently identical cryptogam in several situations to which no malarial odium attached, and, two years later, a similar palmella was observed by Harkness in alpine snow. Other inquirers have associated the occurrence of malaria with the development of different species of algæ or fungi — a coincidence which is perhaps explicable by the favorable conditions for cryptogamic multiplication afforded in marshy regions. It is, at least, evident that from the "palmella gemiasma" to the "limnophysalis hyalina" of Eklund or Balesha's Pontine torula, no single organism has united the suffrages of separate observers.

The most widely discussed outcome of the germ-theory as applied to malarial fevers has been the comparatively recent announcement, by Klebs and Tommasi Crudeli, of the finding of a special bacillus, belonging exclusively to malarial soils, and producing by inoculation or inhalation an intermittent pyrexia. As soon as this publication came to my knowledge I commenced a series of observations regarding the specific nature of the micro-organism in question, with negative results, the recording of which was forestalled by the excellent report to the National Board of Health of Dr. Sternberg, who had reached similar conclusions, and who also pointed out, by means of controlling experiments, that the fluctuations of temperature in rabbits (the subjects of the original research) neither corresponded with the course of malarial paroxysms in man, nor were fairly attributable to any specific infection. Since then I have made a great number of microscopic examinations and artificial cultures of soils from various places, follow-

ing in most instances Klebs' method of preserving an "artificial marsh" and employing different media for subsequent cultivation. These experiments are as yet too few and encompassed by too many elements of uncertainty, to justify any definite assertion; but I may say that I have failed to find any particular schizophyte always present in malarial, and absent from non-malarial, soils. Nearly every specimen of earth contains enough organic matter to furnish, when supplied with moisture, multitudes of "scavenger" bacteria, micrococci, and bacilli, the developmental cycles of which have not yet been studied with accuracy. My own researches in this direction have led me to believe that the so-called "bacillus malariæ" is simply a transition stage in the life-history of a widely spread form, representing the commencement of resting-spore formation. I have several times observed, at a certain point in a culture-series, the appearance of rods corresponding with the descriptions and photo-micrographs of Klebs and Crudeli, and (what may be of some interest) this phase of growth has seemed to be favored by subjecting my miniature marsh to artificial alternations of drought and moisture. These experiments, however, require careful repetition and extension, and I had intended to defer reporting them until more numerous and satisfactory data could be obtained. As regards the toxic action of such microphytes, I have pulverized and inhaled soil which I had previously ascertained to contain them, but without effect, as far as my own person was concerned. I was unable to induce any of my friends to submit to a like trial. Marchiafava claims to have found similar bacilli and spores in the blood, spleen and bone-marrow of three patients dying of pernicious fever, but I have failed to detect either these or the bodies described by Xaveran in several examinations of the living or dead tissues of malarial subjects.

Although we must look to experimental evidence for a final solution of the problem, there are some theoretical considerations which seem opposed to an acceptance of the causative agency of microphytes in malarial fevers. In the first place, the diseases commonly ascribed to a bacterial origin are characterized by communicability from person to person, and, in most of them, at all events, the immunity against repetition conferred by a single attack is explained by the hypothesis of exhaustion of the particular, but undefined, pabulum requisite for the sustenance of the specific parasite. Neither of these characters pertains to malarial disorders, which appear, on the contrary, progressively to increase the victim's susceptibility to recurring seizures. Secondly, whilst malarial emanations seem to be most rife from humid soils and in stagnant air, Miquel has shown by admirably devised experiments that vapors arising from damp soil or from the most polluted of waters are always free from germs. It is only in a desiccated condition that such germs can rise in a still atmosphere. Again, the same accurate observer estimates that the number of cryptogamia spores in a given cubic volume of air is in summer more than twice as great as in spring, and nearly three times greater than in autumn; the latter season, nevertheless, furnishing the severest forms of paroxysmal fever. Moreover, at all times, the number of these air-borne germs is markedly diminished after a rain.

Early in my inquiry, I was struck by the parodoxical fact that peat,

which presents in the highest degree the conditions of dead vegetable matter and moisture, is in all climates asserted to be exempt from malaria, and the difference between this and ordinary marshy soils seemed to offer a promising field for study. The most prominent distinction lies in the power of the peat to prevent decomposition of vegetable matter; preserving submerged twigs and branches for an indefinite period. So marked is its prophylactic influence against fermentative processes, that it has become one of the favorite dressings of antiseptic surgery. It has been shown that most acids antagonize the development of ferments, and peat gives a strongly acid reaction, while the samples of malarial soils which I have examined have been feebly acid or, in some instances, neutral. The question then arose as to the nature of the acid which is most efficient in peat, and I projected a series of analyses of malarial and non-malarial soils to determine the relative percentages of the organic acids (chiefly crenic and apocrenic), intending farther to experiment with these substances upon cryptogamic growth. Unfortunately, the literature of this department of chemistry is very scanty, and the newly begun work, in which my friend, Mr. Louis Gratacap, kindly took an inaugurative part, is insufficient to warrant even a preliminary report. The clue, however, seems to be worth following up, and it may possibly lead other observers to more important results. Those who are committed to the germ theory will, of course, remark that the conditions above ascribed to peat are such as would militate against the development of specific organisms, and adduce the argument of Pasteur, in his memorable controversy with Charlton Bastian, that the addition of an alkali to an apparently sterilized putrescible fluid permitted the development of germs which were not really killed, but merely rendered incapable of growth in an acid medium. On this matter it would be premature to express an opinion. Until we shall possess accurate knowledge of all the physical, chemical and microscopical phenomena of soil water and air, which contradistinguish malarial from non-malarial localities, the immediate causation of malaria will probably remain a vexed question. I have refrained from cumbering this informal summary with references or details of numerous, direct and collateral experiments, which, dealing principally with negations, are scarcely worth recording until the research shall be in a more finished state.

Late and Comprehensive Work of Dr. Harris.

In the autumn of 1882, Dr. Harris proposed to me to devise "plans for opening a methodized work of investigation, record and reporting" in the maritime district, and to undertake a personal examination of different localities, beginning with "the entire line of villages, from Fordham to Dover Plains, along the Harlem railway." The first of these tasks was necessarily deferred until the State Board should be able to organize the co-operation of many local observers; the record was interfered with by the demands of private practice. Past experience has shown that any thing short of a thorough ascertainment of all the circumstances attending an ætiological problem is almost valueless, and tending to mislead judgment.

Last autumn, Dr. Harris desired me to map out, with such skilled

assistance as might be necessary, the "drainage areas, miasmatic foci, and disease charts," as preliminary to a report on "water-sheds and their axes of outfall, water-bearing strata, cryptogams, domiciliary factors, oscillations of ground-water, incidence of disease in particular localities, etc.," in Richmond, Queens and Westchester counties. During the winter no field-work has been practicable; but, as a preparatory step, I procured sectional contour maps of Staten Island for farther annotation. These maps await the disposal of your Board.

On the 28th ultimo I received from Dr. Harris the circular of questions relating to the proposed investigation of the comparative merits of bovine and humanized vaccine virus, with a private letter suggesting some special lines of experiment. The limited field of my observation would prevent the attainment of useful results in this direction, and I confess to a decided prejudice against "arm-to-arm" vaccination, in which it is usually impossible to eliminate the risk of some latent zymosis in the vaccinifer. On the score of both safety and efficacy I have, for a number of years past, used nothing but bovine virus, which, despite the occasional drawbacks of difficulty of preservation and irregularity of evolution, has, in many hundreds of instances, afforded the most satisfactory effects.

Most, if not all, of the plans and suggestions above recapitulated are doubtless matters of record in the office of your Board; but, as they were subjects of private correspondence or oral communication with Dr. Harris, I have felt bound to recite them.

With much regret that the scanty time at my disposal has been so inadequate to aid in carrying out the comprehensive schemes of one for whom I entertained the highest esteem, I have the honor to be

Very respectfully,
Your obedient servant,
ALFRED LUDLOW CARROLL, M. D.

New Brighton, N. Y., *February* 12, 1884.

A Brief Account of Typhus Fever as It Appeared in the City of New York During the Year 1883, *by Edward H. Janes, M. D., Assistant Sanitary Superintendent, Health Department.*

During the year 1883 the city of New York suffered somewhat less from contagious diseases than it had for any one of several previous years. The only event that for a while gave the health authorities any very serious apprehension was an outbreak of typhus fever early in the year. Since September 21, 1882, no case of typhus had been reported until January 9, 1883, when it was learned that a girl aged about fourteen years had been removed from a rear house in Hester street to St. Vincent's Hospital, where the diagnosis of scarlet fever was made, and the patient was immediately transferred to the Riverside Hospital. The diagnosis of scarlet fever not being satisfactory to the resident physician of the latter institution the patient was isolated for further development, or until more could be learned of the history of her case. Dr. McChesney, who investigated the matter, learned that the youngest child of the family, aged about eleven years, was taken sick about November 28, 1882, with what was supposed to be typhoid fever, but which, from a careful analysis of the history and

subsequent events, must have been true typhus. It will suffice here to say that this case was followed by four others, the first one being an older sister, who nursed the patient and was taken sick on the 28th of December, three others following in quick succession, one of which proved fatal. This fatal case was in a neighbor's family — had been exposed to the disease by assisting in caring for the child, and was taken sick at about the same time as the older sister. None of these cases showed any marked symptoms of typhoid fever, and as the latter three coming under observation exhibited unmistakable symptoms of typhus it is quite probable that the former two were of the same nature. Subsequently three other cases followed, two of them being a nurse and a helper at Bellevue Hospital, who took care of one of the Hester street patients for a few days before the disease was recognized. These were removed to Riverside. The last resided in the same house with the Hester street patients, and was more or less exposed to the disease there. She was early removed to Riverside, since which time no more cases appeared in that house or vicinity. We have here a group of eight cases, including the Hester street child first taken sick. Previous to her illness this child had attended a charity school in the neighborhood, but no positive evidence of exposure to the disease there was obtained.

With the exception of two cases, one of which was not reported until after death, and was only then regarded as a "suspicious case," we heard no more of typhus until the 20th of April, when two patients were reported to the Sanitary Bureau, one of whom was afterward found to be connected with a group of six others which came to light on the 23d of April at a house on Sixth street, where five had sickened and recovered before the fact came to the knowledge of the health authorities. On the 2d of May two other cases were removed from this house, and on June 27 two sisters who had lived there until within a short time, and had been exposed to the contagion, sickened and were removed from their new residence to Riverside, thus making a group of eleven in all connected with this one house. Had the incipient cases in each of the foregoing groups been promptly recognized and reported to the Board of Health proper measures for isolation and prevention would at once have been instituted and much sickness and loss of life prevented.

By far the most interesting group of typhus fever cases met in this year's experience occurred at St. Stephen's House, a well-organized and well-conducted charitable institution under the care of the sisters of charity. Attention was first directed to this institution on the 23d of April, when information was received from Bellevue Hospital to the effect that ten of the children — ages varying from five to nine years — had been removed to that institution, supposed at first to have scarlet fever, but upon careful investigation it was found that some of them exhibited symptoms very suspicious of typhus. These were removed to Riverside, where in a short time the symptoms in each case were sufficiently developed to establish the diagnosis beyond doubt. On the following day the Home was visited by Dr. McChesney, who found five children — ages varying from four to twelve years — and one of the sisters in charge, all showing incipient signs of the fever, and who were removed without delay. On the 25th two, aged respect-

ively five and eight years, on the 26th, one, aged four, on the 30th, one; May 1, one; May 7, one; May 23, one; May 30, one, these varying in age from four to ten years, were taken with the fever and removed. These completed the group, with the exception of one or two who left the Home as soon as the nature of the sickness was ascertained, and went to their parents where they sickened with the same fever.

The disease had been confined to one of the three houses occupied by the Home, and as the occasional appearance of a case during the month of May indicated that this house might be so infected as to give us subsequent trouble, perhaps extending to the other houses, the question of vacating the house for a season that it might be thoroughly fumigated, cleansed and renovated was at once considered. The other houses were full, and had that not been the case the idea of adding to their numbers children from the infected house could not for a moment be tolerated. Hence the question how to safely dispose of the inmates had first to be settled. An old hospital building on North Brother island had been recently put in repair by the Board of Health, and as it was at that time unoccupied its use was tendered to the sisters during the warm weather, or until the infected house could be sufficiently renovated to render it safe for occupancy. To this place the children were removed without delay, two of the sisters being placed in charge with such assistance as was necessary. Once in their new quarters, the weather being pleasant, the children spent most of their time out of doors breathing pure, bracing air from the salt water, romping over the island, and enjoying the luxury of salt water bathing at proper intervals and under proper supervision. Under such circumstances, it is almost needless to say, no more typhus appeared in this little community, and there being no other use for the building the children were allowed to occupy it until the cool weather drove them back to their former home in the city, which in the meantime had been submitted to such a disinfecting and renovating as to destroy the last germ of the disease which had found a lodgment there.

As the disease is generally of a much milder type in children than in adults the results of treatment furnished no exception in this case. The children recovered and the sister died. One of the trained nurses at Riverside who attended to these cases took the fever in a very severe form, but after a hard struggle was brought safely through.

The groups thus far mentioned illustrate the importance of early recognition of the disease and the removal of patients if we would prevent its extension. Subsequent instances illustrated the same necessity, for whenever a first case was early reported and promptly removed the disease generally ended there, or with a single additional case. It was the invariable practice after the removal of a patient and fumigating the apartment to watch the house carefully for about two weeks, that any additional case might be found early and properly dealt with. The only other group of importance was at a house in Water street, from which four cases were removed, three of them being sick when the disease was first discovered there.

The whole number coming under care of the health department during the year was sixty-nine, of which two were emigrants and one

a steamship officer. With exception of the groups mentioned the cases were considerably scattered, appearing one, two or three weekly, and sometimes at intervals of several weeks. As in other seasons the disease usually appeared in low and filthy quarters, or where there were many persons together. It was probably introduced to the Home by a mild, unrecognized case, or perhaps one of the inmates may have been exposed and infected the house either by person or clothing, as there were doubtless many cases in the city.

THE LUNG PLAGUE OF CATTLE.

CORNELL UNIVERSITY, ITHACA, N. Y., *February* 18, 1884.

Dr. F. C. CURTIS :

DEAR DOCTOR — I trust the inclosed will serve your purpose. I endeavored to limit it to two pages of your report, and have very nearly succeeded. It is matter for regret that all the bills drawn on the subject of lung plague have been framed by men who drew their information from some book and who inevitably stumbled into blunders from which an extensive professional acquaintance with the plague would have saved them. It does not seem as if any thing were likely to be done at Washington this year. Is any thing proposed at Albany ?

Faithfully yours,

JAMES LAW.

Though not a disease of man the contagious pluero-pneumonia or lung plague of cattle has some bearing on the work of a State Board of Health.

1. *It is an example of a purely contagious malady* which is unknown in any part of the world excepting as it has been introduced by an infected animal or its products. Thus its advances have been historically traced (in connection with the importation of cattle from previously infected countries) into Holland in 1833 ; into Great Britain in 1839–42 ; into Holstein, Denmark, Norway and Sweden a few years later ; into Oldenbury in 1858 ; into New Jersey in 1847 ; into Brooklyn in 1848 ; into Massachusetts in 1859 ; into South Africa in 1854 ; into Australia in 1858, and to Tasmania and New Zealand some years later. Wherever in these newly-invaded countries it was infected and allowed to spread the disease has maintained its hold and extended its ravages to the present day, whilst in certain countries (Holstein, Denmark, Norway, Sweden, Oldenbury, Switzerland, Massachusetts and Connecticut) where the requisite measures were taken to purify every center of infection the plague was permanently extinguished, and never reappeared until there was a renewed importation of the *contagium*. Similarly in lands situated out of the region of the cattle traffic from infected countries (Spain, Portugal, the Channel Islands, Iceland, British North America, our Western and Southern States, South America, etc.) the affection has never appeared from the mere fact that the opportunity for the introduction of the *contagium* has not occurred.

Such constancy of results, drawn from world-wide sources, furnishes a perfect guaranty of the possibility of securing the complete extinction of a disease which is known only as the result of contagion, and an unimpeachable argument in favor of legislation for the suppression of every such deadly contagious disease, whether of man or beast.

2. *The lung plague of cattle interferes with the supply of sound and wholesome meat and milk to any community among which it prevails.* While this affection is not, as such, transmissible to any other animal than the bovine races, yet its insidious and protracted course in these insures the marketing of much meat and milk of very inferior if not absolutely injurious character. Wherever lung plague prevails there occur, and especially in the cold season, a number of cases so mild that they are practically overlooked by the owners, and the milk from the furred systems is furnished to the customers as before. Again in cases that have passed through a mild attack and are supposed to have recovered, there are usually left in the chest gangrenous masses of lung which have been cut off from blood supply and inclosed in fibrous sacs. Such sequestra gradually undergo liquefaction and absorption for a period of six months, a year or more, and during this period the bearer, if a milch cow, often yields a liberal supply of milk, which is unhesitatingly and ignorantly sold to customers. Such milk, it is true, does not produce in man the contagious pluero-pneumonia, yet as in all fibrile diseases its proximate elements are modified and abnormal products are added which interfere with its wholesome and nutritious properties and render it more or less injurious to the susceptible digestive organs of infants and invalids.

It must be added that the flesh of cattle, killed in the early or fibrile stage of this disease, or in the advanced gangrenous stage, is to a very considerable extent thrown upon the market, the better qualities as roasts, steaks, etc., and poorer as sausage or mince-meat. As human food these are open to all the charges of impaired nutritive property and unwholesomeness that may be brought against the milk.

3. *The lung plague, like any other inflammatory affliction of the lungs, favors the development of tuberculosis.* While a strong and vigorous system will throw off the germs of tuberculosis, the animal, already reduced by disease, falls an easy victim. Again, the local inflammation in the lungs, the persisting irritation, and the presence of newly formed and susceptible tissues all predispose that organ to the attack of tuberculosis, and thus this bovine disease from which man possesses an immunity paves the way for that which finds a susceptible soil in man and beast alike. With our present knowledge of the communicability of tuberculosis, not only by inoculation, but as the germs are inhaled with the breath or ingested with meat or milk, we cannot ignore the real, if indirect, influence of lung plague in the development and propagation of one of the most subtle and deadly of the diseases of man. Under this view, the suppression and extinction of the lung plague is no longer simply a question of the saving of two or three millions yearly to the cattle industry of the United States, and of the protection of the rapidly increasing herds of the Middle, Southern and Western States against the extension of the contagion, but also a real and present sanitary measure for the people in districts where the plague now prevails.

PRESENT AREA OF INFECTION.

In the absence of systematic records and examinations of herds it is impossible to state with precision the various sites of infection now in existence. The lung plague is, however, known to be prevalent in the cities of New York and Brooklyn and their suburbs (Queens county), in Staten Island, and in Westchester county in this State. The outbreak in Dutchess county a year ago was brought to an end by the disposal of the herd. The recent alleged outbreak in Columbia county, I found, on personal investigation, including *post mortem* examination, to be only acute congestion of the lungs without a lesion indicative of lung plague, and a report of the disease in Putnam county has not been verified. Of the other States the infection is known to exist in New Jersey, Maryland and District of Columbia; herds are still held in quarantine in Eastern Pennsylvania, and there is a presumption of the presence of the malady in Virginia and Delaware.

Lung plague eradicated with ease from well-fenced farms but only with difficulty from cities. In country districts where herds are not kept in close proximity, where they do not meet on common highways nor pasturages, where there is little or no interchange of cattle among different herds, and where a common interest leads to a neighborly surveillance over each of their herds, the suppression of this plague has always proved a comparatively easy matter, whereas in cities, where cattle are constantly passing from herd to herd, and worse still, from infected dealer's stables to dairy herds, where many herds are turned out together or successively on unfenced pastures, and where the easy disposal of the sick for beef or otherwise facilitates the covering up of infection, the extirpation of the plague is much more difficult. The extinction of the disease in Massachusetts and Connecticut was accomplished in country districts only, the infection never having become seated in the dairy herds of the large cities. The claim that Pennsylvania has been repeatedly cleared of the infection is based on a similar experience. The stamping out has only been done on isolated farms, while the dairies of Philadelphia and Germantown have never been touched.

The work to be done in our large infected cities and their suburbs is of another kind, demanding a different system and a closer vigilance. To work effectually we must for at least six months keep an exact record of every herd in the infected and suspected districts, of every change in a herd by movement, of all deaths and their causes as ascertained by *post mortem* examination, and of any case of disease as ascertained by necropsy of every animal (without exception) taken from such herds for slaughter by the butcher or otherwise; we must secure in addition the thorough disinfection of any building now used, or that has been used for holding cattle; we must prevent the movement of cattle into or out of any herd in the scheduled district excepting under proper guaranties and license, and above all, the pasturage of different herds on the same lots.

In this way, before the end of the six months, every center of infection would be definitely ascertained and it would be a very easy matter to stamp out the disease either by the slaughter of the whole herd or by a slower process, as might seem most desirable.

Such a system would at the same time detect with certainty all cases of tuberculosis, actimonycosis, and other affections transmissible to man through the meat and milk, and enable the authorities to largely restrict these diseases by cutting off the sources of infection to the population of our seaboard cities. Without entering fully at this point into the question of method it is well to emphasize the truth that a proper method of dealing with the plague will result not only in a most important benefit to that extensive and rapidly growing national industry (the production of cattle), but prove at the same time a boon of unspeakable value in its contribution to a better hygienic and sanitary condition of our eastern city population.

Respectfully submitted.

JAMES LAW.

Diphtheria at Indian Lake.

The first cases of diphtheria in the vicinity of Indian Lake, of which I was able to obtain any information, occurred in January and February, 1880, in three families, and are called in this report the First Group. The family of H. W. Lanphere is the only one of the three now residing in the neighborhood, and my information was mostly obtained from Mr. Lanphere himself, who resides about three miles from Indian Lake village, on what is known as Big brook. The main facts, however, were substantiated by other citizens who were acquainted with them. I also accidentally met Mr. Elijah Camp, now residing at Moose Lake, who certified the facts relative to his own family.

In the winter of 1879 and 1880 Walter Hutchins lived with his family in a lumber camp in Minerva and lost a child from diphtheria. It was brought to Indian Lake for burial and a public funeral was held.

During the time that this child of Walter Hutchins was sick it visited at the house of A. Hutchins in Indian Lake, near H. W. Lanphere's. It had membrane in its throat at the time. Lanphere's daughter was at A. Hutchins' at the same time and held the Hutchins child in her lap. She soon afterward had diphtheria and recovered. This was the first case in Indian Lake.

The next cases were in the family of William Aldons. Mrs. William Aldons is daughter of H. W. Lanphere. Children of Aldons visited at Lanphere's while the Lanphere girl was sick. Six Aldons children had diphtheria and three died.

A daughter of Elijah Camp was doing housework in the family of Aldons during the sickness of the Aldons children. She became sick as did two other children of Camp's. One died.

This completes the first group of cases, and nothing more was heard of the disease here until August, 1881, a period of eighteen months.

The Second Group of cases began in the family of Beriah Wilbor. Wilbor was conducting one of the hotels at Indian Lake. The origin of this first case is obscure. There is at present no evidence of a local cause of the disease, though it cannot be denied that such a cause may possibly have existed. It seems more reasonable to assume that as it occurred in a public house on a public thoroughfare the cause was brought there by some infected person or in infected material.

Clarence, aged two years, was taken sick in the latter part of August, 1881, and died after four days.

Beriah, aged ten years, was taken sick October 5 and died October 7, 1881.

Tommy, aged seven years, was sick later and recovered.

There had been numerous cases in the immediate neighborhood between the occurrence of these cases, and there had been public funerals.

The family of Joel Brooks consisted of eight persons, viz.: Mr. Brooks, his wife and six children. These children were all at Wilbor's while the Wilbor child was sick, and Frank attended the funeral of the Wilbor child.

Ernest, aged nine years, was taken sick early in September, 1881, and recovered.

Viola, aged six years, was taken sick about the same time as Ernest, and died October 8.

Frank, aged fourteen years, was taken sick after Viola, and died September 25.

Adelbert, aged two years, was taken sick after Frank, and died September 24.

Waldo, aged four years, was taken sick September 23, and died October 9.

Eddie, aged eleven years, was taken sick September 23, and recovered.

Allen Brooks is brother of Joel Brooks and was at the house of his brother during the sickness there.

His daughter Susan, aged ten years, was taken sick September 26, and died after twenty days.

James Forbes lived across the street from Allen Brooks, and Jennie Forbes was at Wilbor's while Wilbor's children were sick.

Jennie, aged seven years, was taken sick September 30, and died after three days.

Lena, aged seventeen months, was taken sick September 30, and died after three days.

Edwin, aged ten years, was taken sick October 1, and died after eleven days.

Nellie, aged , was taken sick October 12, and recovered.

Edward Wilson s family consisted of five persons, viz., Wilson, his wife and three children; Wilson's mother lived next door to himself. This Mrs. Wilson, the mother, visited at Wilbor's and at Brooks' during the sickness in those families, and Wilson's oldest child Gertrude was in the habit of going to and staying at her grandmother's.

Gertrude, aged four years, was taken sick October 3, and died October 6.

Clara, aged two years, was taken sick October 7, and died October 14.

Mrs. Edward Wilson was taken sick October 8, and recovered.

John, aged one year, was taken sick October 12, and recovered.

In the family of Isaac Pinney, who lived across the street from Wilbor's, there were two cases of sickness. The son Chauncey,* who

* Mentioned among the fevers.

presented a history of fever rather than of sore throat, and the daughter, Margaret, aged twenty-two years, who was taken sick with sore throat October 8, and recovered after six weeks.

William Pashley's family consisted of seven persons, viz., Pashley, his wife and five children. Pashley and his wife visited and cared for the sick in the families of Joel Brooks, James Forbes, Allen Brooks and James Bell and attended funerals.

Lilly, aged five years, was taken sick November 1, and died in three or four days.

John, aged fifteen years, was taken sick a week later and died after four days.

Louisa, aged eighteen years, was taken sick the next day after John and recovered.

George, aged twenty-one years, was taken sick the same day as Louisa and recovered.

Chauncey Hill lived on Cedar river, some three miles from Indian Lake village. Mrs. Hill is a sister of Mrs. Pashley. She visited the sick there and allowed her children to kiss the corpse of one of the Pashley children.

Rocksa, aged ten years, taken sick November 11, and died after seven days, November 18.

Musa, aged seven years, taken sick November 12, and died November 17.

James Bell lived on Cedar river, some five miles from Indian Lake village, but Mrs. Bell is sister of Mrs. Chauncey Hill and of Mrs. William Pashley, and was in the habit of visiting among the sick. She was at Pashley's during sickness there, and when one of the Pashley children died. And she and her husband attended the funeral of one of the Pashley children.

She was taken sick early in November, and recovered after two weeks.

Thomas, aged four years, was taken sick November 19, and died November 22.

Philander Ovits lived neighbor to Chauncey Hill, and attended funerals. While he was sick with fever the doctor who attended him was also attending diphtheria. *The cat had some throat difficulty and died.*

Della aged six years, was taken sick in January, 1882, and recovered.

Lola, aged four years, was taken sick about ten days later, and recovered.

This ends the second group.

The third group of cases commenced in the family of Gasper King, whose home was some seven miles south-west from the village of Indian Lake. King had been living with his family in a lumber shanty, and at the time of sickness had just moved out to their home, stopping on the way at Wilbor's hotel.

About the middle of January, 1882, two of his children were sick and died of diphtheria.

Frank Carroll was a neighbor to King and helped to bury the King children. His son Charles, aged 12 years, was taken sick February 2, 1882, and died February 14.

James Eldridge was a neighbor to Frank Carroll; Eldridge's wife was

at Carroll's during the sickness there. Soon afterward an Eldridge child died of diphtheria.

William Plue was also a neighbor to Carroll and attended the funeral of Carroll's child. Soon afterward he lost a child of diphtheria.

INDIAN LAKE.

Group I — Children.

Lanphere, H. W. Daughter; January, 1880; recovered.

Aldons, Wm. Six children; January, 1880; three died and three recovered.

Camp, Elijah. Three children; February, 1880; one died and three recovered.

Group II.

Wilbor, Beriah. Clarence; age two years; latter part of August, 1881; sick four days; died.
Beriah, Jr.; age ten months; Oct. 5, 1881; sick three days; died.
Thomas; age seven years; later; recovered.

Brooks, Joel. Ernest; age nine years; September, 1881; recovered.
Viola; age six years; September, 1881; sick till October 8; died.
Frank; age fourteen years; after Viola; sick till Sept. 25; died.
Adelbert; age two years; after Frank; sick till Sept. 24; died.
Waldo; age four years; Sept. 23, 1881; sick seventeen days; died.
Eddie; age eleven years; Sept. 23, 1881; recovered.

Brooks, Allen. Susan; age ten years; Sept. 26, 1881; sick twenty days; died.

Forbes, James. Jennie; age seven years; Sept. 28, 1881; recovered.
Lena; age seventeen months; September 30, 1881; sick three days; died.
Edwin; age ten years; Oct. 1, 1881; sick eleven days; died.
Nellie; October 12, 1881; recovered.

Wilson, Edward. Gertrude; age four years; Oct. 3, 1881; sick four days; died.
Clara; age two years; October 7, 1881: sick eight days; died.
Mrs.; October 8, 1881; recovered.
John; age one year; October 12, 1881; recovered.

Pinney, Isaac. Margaret; age twenty-two years; Oct. 8, 1881; sick six days; recovered.

Pashley, Wm. Lilly, age five years; Oct. 1, 1881; sick three or four days; died.
John; age fifteen years; a week latter; sick four days; died.
Louisa; age eighteen years; next day; sick four days; recovered.
George; age twenty-one; next day; recovered.

Hill, Chauncey. Rocksa; age ten years; Nov. 11, 1881; seven days; died.
Musa, age seven years; Nov. 12, 1881; sick five days; died.

Bell, James. Mrs. Bell; early in Nov. 1881, sick two days; recovered.
Thomas; age four years; Nov. 19, 1881; sick three days; died.

Ovits, Philander. Della; age six years; Jan 1882; recovered.
Lola; age four years; ten days later; recovered.

Group III.

King, Jasper. Two children; about middle of Jan. 1882; died.
Carroll, Frank. Charles; age twelve years; Feb. 2, 1882; thirteen days; died.
Eldridge, James. Child; after Carroll's; died.
Plue, Wm. Child; after Carroll's; died.
Total at Indian Lake, forty-four cases with twenty-five deaths.

BLUE MOUNTAIN LAKE.

Austin. Boy; August, 1881; died.
Lasley, Edward. Himself; August, 1881, sick till August 13; died.
Howard, Reuben. Barton, age twelve years; August 20, 1881; sick twelve days; died.
Annie; August 31, 1881; recovered.
La Prairie, Joseph. Lizzie; age eleven years; February 9, 1881; recovered.
Rosa; age nine years; February 19, 1881; recovered.
Adelbert E.; age three years; February 19, 1883; recovered.
Total at Blue Mountain Lake, seven cases with three deaths.

LONG LAKE.

Wood, Jerome. Edward; age seven years; August, 1881; sick two weeks; died.
Jerome; August, 1881; recovered.
Wood, Frank. Child; September, 1881; died.
Mrs. Wood; September, 1881; died.
Plumby, John E. Five persons, September, 1881; one died and four recovered.
Cullens, William. Two persons; September, 1881; one died and one recovered.
Cole, Henry. 1879; four deaths.
Robinson, Amos. 1879; two deaths.
Total at Long Lake, seventeen cases with eleven deaths

I was unable to satisfactorily account for the origin of the disease at Blue Mountain Lake. With the lapse of time changes had occurred in local conditions, and parties who might perhaps have furnished explanatory facts at the time of sickness were not to be found at the time of my visit. A statement was made to me, however, that the surroundings of the school-house were unhealthy, and as the first cases were children attending school, it may be that the disease originated in a local cause. A new school-house has since been erected, and the old saw-mill, the upper story of which was used for school purposes, is no longer promoted to such uses.

The first case was a boy named Austin, who was taken sick in school, and remained in school during the day. He died. This was in August, 1881.

The next case was Edward Lasley, an adult, a neighbor to the boy, who died August 13, 1881.

The next cases occurred in the family of Reuben Howard. Howard's children attended school and were present at the time the Austin boy

was taken sick. Also Mrs. Edward Lasley is daughter of Mrs. Howard, and Mrs. Howard and her mother, Mrs. Patty Wood, of Long Lake, then visiting at Howard's, cared for Lasley during his sickness.

Barton Howard, aged twelve years, was taken sick about August 20 and died September 1, 1881.

Annie Howard, taken sick August 31; recovered.

It may also be stated in this connection as having a possible relation to the origin of these cases, that the teacher of the school was a lady from Johnsburgh, where diphtheria was then prevalent.

The next cases were in the family of Joseph La Prairie, and did not occur until February, 1882.

La Prairie's family consisted of seven persons, viz.: Himself, wife and five children.

Lizzie, aged eleven years, was taken sick February 9, 1882. Recovered.

Rosa, aged nine years, was taken sick ten days later. Recovered.

Adelbert Eugene, aged three years, was taken sick about the same time as Rosa. Recovered.

If these were genuine cases of diphtheria I was able to obtain no clue to their origin. Possibly they were not diphtheria.

The first authentic account of diphtheria occurring at Long Lake is of that in the family of Jerome Wood. Jerome Wood is son of Mrs. Patty Wood, before mentioned as mother of Mrs. Reuben Howard at Blue Mountain Lake. A son of Jerome, named Edward Jerome, aged seven years, went with his grandmother, Mrs. Patty Wood, to Howard's at Blue Mountain Lake at the time of the sickness in Howard's family. This boy was taken sick at Howard's. His father attempted to bring him home to Long Lake, and the child died en route at Forked Lake. He was sick two weeks. The father contracted the disease and was sick at Forked Lake but finally recovered. He was, however, unable to attend to the burial of his boy. Consequently his brother Frank Wood, of Long Lake, brought the corpse home to Long Lake and buried it. Jerome Wood came to his brother Frank's before he had entirely recovered. Also the grandmother, Mrs. Patty Wood, came down from Blue Mountain Lake.

Frank Wood's child and wife were taken sick in September and both died.

The next cases were in the families of John E. Plumley and William Cullens. These two families lived together. Mrs. Cullens was daughter of Plumley. She took care of Frank Wood's wife and child. Also the children of these families were at Frank Wood's during sickness there. In the Plumley and Cullens families there were seven cases of diphtheria with two deaths.

I was also informed of six cases of sickness and death which occurred here in 1879, but, as there was doubt as to diagnosis and they appeared to be disconnected with this epidemic, I have not included them in the tabular report. They were in the families of Henry Cole and Amos Robinson. These families were poor and Cole is said to have been very filthy. One doctor called the disease diphtheria and another scarlet fever.

These families were neighbors. The disease commenced in Cole's family. Cole's wife and three children died.

Robinson's wife helped care for Cole's family. She and one child died.

At Slingerlands.

Slingerlands, N. Y., *May* 9, 1883.

Dr. Harris:

My Dear Sir — I wish to report to your Board that I have in one family a severe type of diphtheria — the first I have seen since practicing here (five and one-half years). One died this morning of diphtheretic croup, aged about three years. Another is sick with which I think, of a malignant type, aged about ten years. Another aged about ten months is complaining this morning and I fear she will have it, but cannot yet say. I had two others removed from home as soon as I could, and understand this morning that last night one of them was attacked. Am doing all I possibly can to prevent its spreading— following the directions published by your Board. Have ordered the dead body to be buried to-day. As we have no local board here I write you, as I have no blanks to use. Whether it will prove endemic or epidemic I cannot yet tell. Can arrive to no satisfactory solution as yet to its cause. Should you have any suggestions to make would be glad to hear from you. Please excuse the form of this as I can do no better not having the necessary materials, but I thought it right to inform you early.

Hastily yours,
D. C. CASE, M. D.

Albany, *May* 11, 1883.

To Dr. Elisha Harris, *Secretary State Board of Health:*

Dear Sir — Agreeably to your request and orders, I have this day examined the residence and premises of Mr. Alfred E. Whittle, of Slingerlands, Albany county, where an epidemic of malignant diphtheria is at present prevailing, and would respectfully report the condition of the premises, and a brief history of the cases that have proved fatal. In order to facilitate matters, I shall describe the residence and surroundings as per the following diagram:

The house is situated about a mile from Slingerland Station, on the D. & H. railroad, Susquehanna Division. A. The house in which the family, which is composed of Mr. and Mrs. Whittle and five children, resided. It is situated on a *sandy soil* about thirty feet from the road-way.

B. Green-house.

C. Well from which the family is supplied with drinking water is in a *sandy soil*, and is situated at the bottom of a grade, the summit of which is at E and D There is probably a fall of from five to six feet from E to C, and the distance is thirty-five feet (approximately).

D. Privy is also situated on ground which is considerably higher than the foundation of the house, and on the same sandy soil which is characteristic of the neighborhood. Sandy and would admit of considerable percolation.

A dense growth of young trees is thriving just back of the privy, marked F.

E. A mass of garbage which has been deposited there — just behind and against privy — from day to day, for a period extending over a year or more — a statement which was made to me personally, by Dr. D. C. Case, the attending physician — and is comprised of both animal and vegetable matter. The amount can be roughly estimated, when it is stated the actual measurements are, length nine feet, width four feet, and from eighteen to twenty-four inches in depth. This mass has been, and is at present, exposed to the rays of the sun, and the rain. This I consider the principal factor in the production of the present epidemic, yet I would not overlook the probable results that might be caused by the percolation of the excremental and refuse matter combined (from E and D) — considering the grade and soil as two of the most important conditions likely to produce such a result.

A few days previous to the attack of the first of the three children, which were aged two and one-half years, eleven years, and ten months, respectively, the two elder children were at play over the garbage mass, removing the leaves, and part of the contents of the refuse matter. On the same day, or the next, the younger of the two, Harold Whittles, was taken with an acute tonsilitis, which, at the expiration of one week — according to Dr. Case's verbal statement, "the tonsils ruptured and discharged a laudible pus." In two days after the above mentioned rupture, the child joined its brother at play and was apparently as healthy as usual. On May 3, it was taken with a chill and in a short time the temperature reached as high as high as 106° 4′, remained for about twelve hours, then as suddenly dropped to 102° and remained with slight fluctuations throughout the course of the fever.

On examination of the throat, diphtheritic patches were noticed covering both tonsils and extending downward till they were lost to sight.

Bowels were normal. *Urine.* The small amount and high color were so marked that the physician's attention was called to the fact by the mother, and on examination of the urine, albumen was found to be present in abundance.

The child remained in a comatose condition and died on the sixth day.

Albert E. Whittles, age eleven years, four months and five days, the elder child, who was apparently well, was taken with a severe chill on the 5th day of May, which was followed by a high fever, temperature not taken.

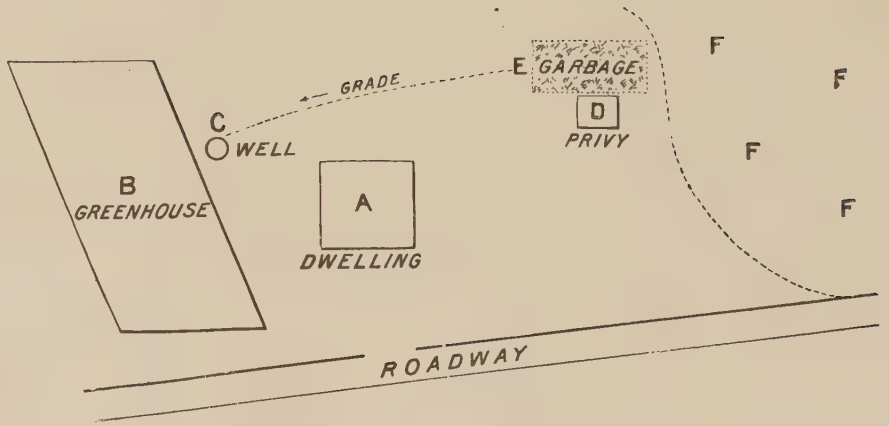
Friday 4th, he attended school and was feeling well until Saturday when the above symptoms made themselves manifest.

This case exhibited marked prostration from attack till death.

During the course of the disease patient experienced a bloody and mucous discharge almost daily from the post nares, which was accompanied by a fetid odor suggesting decomposing animal matter.

Exudation abundant, involving both tonsils and palate.

Pulse thready and weak and temperature sub-normal for some time previous to death.


GRADE
E
GARBAGE
F
F
F
F
C
WELL
D
PRIVY
B
GREENHOUSE
A
DWELLING
ROADWAY

Face during the last stages of the disease presented an angry mahogany appearance.

Maud Whittles, age ten months, is now suffering from the disease and presents about the same symptoms which proved fatal to Harold, and will probably do so in this case.

The two remaining children, at the request of the father, and by the orders of Dr. D. C. Case, were sent to Albany for safety. One located on North Pearl street is under the care of Dr. Milbank, now with marked symptoms of the disease. The other is located in Congress street and is still free from the symptoms.

The attending physician likewise ordered the mother and child in the adjacent house to change their quarters which they have done.

The disease is at present endemic, and confined to the family in which it originated.

Disinfection and strict quarantining have been fully carried out by the attending physician, and should another case occur, it is thought advisable to close the school-house and fumigate it thoroughly with sulphur.

The garbage pile has been saturated *thoroughly* with a solution of zinc sulphur and common salt, and when the weather becomes cold enough to warrant it, the mass shall be removed. (It is now covered by earth.)

Respectfully submitted,

GEO. FRED. BROOKS, M. D.

ALBANY, *May* 17, 1883.

Maud Whittles, the youngest and last of the children at Slingerlands, died at home on the inst., and one of the two sent to Albany by Dr. Case died on the inst.

The funerals of both were private and without delay.

Only one of the five children remains alive. This one is now a resident of Albany on Congress street.

B.

REPORT OF THE COMMITTEE ON EFFLUVIUM NUISANCES.

REPORT.

ALBANY, *July* 6, 1883.

To His Excellency, GROVER CLEVELAND, *Governor:*

SIR — The undersigned, on behalf of the State Board of Health and by its order, make the following return to you of information and conclusions relating to the subjects mentioned in the petition, dated New York, June 7, 1883, and referred to this Board on the 11th of June.

The petition is signed by numerous and well-known citizens, several of whom are largely responsible to the public for the proper and safe management of passenger railways which extend through and beyond the districts wherein numerous causes of stenches and pollution of the atmosphere exist. Important evidence on this subject is herewith submitted.

In the inspector's reports marked A, B and C, it is shown that there are four divisions of the Long Island railroad along and near the course of which at certain places, offensive and sickening stenches are suffered by railway passengers and people residing in neighborhoods of said localities; and that, in the order or series in which they occur, these nuisances consist of and are caused by,

1. The deposit and detention of vast quantities of stable manure from the city of New York, which remains for an indefinite though relatively brief period on flatboats, and the open railway cars alongside and upon which "their offensive contents are piled in heaps at various points close to the track," also that "these loaded manure cars are allowed to stand on side tracks near passenger depots," and that even while in transit the nuisance from the manure is very great.

The stench nuisance next in the series along the main trunk of the Long Island railroad consists of and is located at and near the old distillery and yeast factory recently known as Gaff & Fleischmann's, and now controlled by an ownership and superintendent mentioned in the inspector's list. It has long been an insufferable nuisance because of the "swill-like odor of the mash," and still more, because of the fact that the cattle stables on the right alongside the railroad track are reeking with semi-liquid filth (see page 12 of report marked C).

The next in the series is Preston's bone-boiling, bone-burning and fertilizer establishment where the "web scrap," horse-flesh, entrails and other putrescent matters from numerous fat rendering factories are stored in great quantities, and where bones and refuse flesh and waste "clippings" from the markets and elsewhere are boiled in

kettles that are not kept suitably covered, which necessarily pollute the atmosphere to a considerable extent beyond the premises, which are located close along the south side of the Long Island railroad track. The business of calcining the bones obtained in the business just mentioned, and from other sources, is carried on at Preston's factory, and is a source of very offensive stenches which extend along the line of the railroad for half a mile or more. This factory being a branch of the fertilizer factory owned by the same persons and situated near Keyport, N. J., much of the storage as well as mixing of materials for the latter establishment is carried on at this place in Blissville, and at times is the source of exceptional offensiveness.

Next is the place of John Kehoe, situated near Preston's and the distillery above described. He boils fat in open kettles.

Reid's fertilizer factory is next in order as we proceed eastward upon the north bank of Newtown creek. Superphosphate fertilizer is made by the use of sulphuric acid upon scrap and the phosphate rock of South Carolina.

Though the offensive odor does not extend a great distance, and probably is offensive to only railway passengers and along the line of the railway, the business is too offensive to be long permitted to remain close by the side of a great highway like that of the Long Island railroad.

Next in the series is the bone boiling establishment of Fred. Hoffner, who works with open kettles, giving off excessively offensive stenches.

Simon Steinfel's rendering establishment, which is on Furman's island in Newtown creek (and within the limits of Newtown), gives off very offensive emanations for a long distance in the course of the railway route. Great quantities of decomposing animal matters were found upon the premises in barrels and otherwise packed in readiness for rendering.

Kirkman & Sons' rendering establishment, near Steinfel's, boil and render fat and scrap in open kettles.

At John C. Muller & Co.'s bone-black factory, at the same place as above mentioned, imported and domestic bones are burned, after being boiled in open kettles to remove all fat. The bone-tar, one of the results of bone varnish, is mixed with soft coal and burned as fuel. It is very offensive.

C. Meyer's bone-black factory, at the same place and of essentially the same business, is very offensive. The odor is described by the inspectors, who are expert chemists, as being extremely pungent and sickening. They say: It is doubtful if this industry can be carried on without being offensive constantly. The drainage of all these works on Furman's island, on Newtown creek, as here described, passes out through an open ditch into the creek.

Henry Berau's rendering establishment on Newtown creek has the contract for removing dead animals from Brooklyn. This place is tributary to that of Preston's, already described. His business is exceedingly offensive, and too near the populous cities and their suburbs.

These several places are sources of constant offensiveness to railway travelers, and few have any idea of the sources whence the stenches come.

Brooklyn Excavating Co.'s dumping of night soil is carried on near the border of Brooklyn city-lines, between Grand street and North Second street, only 300 feet from the railroad track. The stench from the nuisance is exceedingly offensive.

Benjamin Rosenzweig's fat rendering near Newtown creek, near the railroads, is excessively offensive, the work being carried on from seven in the evening till five in the morning.

G. W. Baker's fertilizer factory, close by the railroad track, between Grand street and Metropolitan avenue, is excessively offensive. It manufactures rotten bone manure, tank sediment manure and neats-foot oil.

Offensive manure is found lying in heaps by the railroad tracks at Fresh pond and near Jamaica, on side tracks of the railroad, close by the station, where car loads of offensive stable manure were examined by this Board's inspector.

On the line of the Long Island city division, known as the Manhattan Beach railway, pig-styes and cow stables are numerous, and in an offensive and filthy condition.

The nuisances hereinbefore described and found chiefly upon the Montauk division (south shore) of the Long Island railroad and upon the Long Island city division of the New York and Manhattan Beach railway.

George Ackerman's fat boiling establishment on the flats of Newtown creek, Queens county side of it and near Metropolitan avenue, uses open kettles, presses oil from fish and renders fat from butchers' scrap.

John Briggs' fertilizer factory, on the "flats" of the same locality, works at night. A tank of sludge acid and much offensive sludge-tar found in the yard, and in a little estuary of the creek. At these premises piles of mixed sludge material, bones, hoofs and horse feet in an offensive condition lay piled in the shed on the premises, at the time of last inspection, a few days ago.

J. Barnett's starch works, on the flats same as foregoing works. A great amount of waste nitrogenous matter was found floating in the creek and thrown upon the meadow. The drainage is through an open ditch and the putrescent material here described is offensive and is dangerous to the public health.

E. R. & R. B. Livermore's starch works. All drainage and sewage flow into Newtown creek through open ditches.

Along the line of the railway from Long Island City to Flushing, are found eight varnish factories between the Thirty-fourth street ferry and Woodside. The odor from these factories is at times very offensive because of the neglect of certain details in the processes of the manufacturer. The owners of these factories are by name recited on page three of the inspectors' report marked C. They are described in detail in report marked B.

Pig-styes and cow-stables — The inspectors describe six of these nuisances as being near and a little west of the Woodside railroad station. In the first one were found sixty pigs, thirty-two cows and six goats, besides many other domestic animals.

The stables and the filthy condition of keeping manure must, if possible, be corrected. The animals are mostly kept upon "hotel

swill," which is boiled on the premises in open kettles and fed to the animals.

Grease is boiled and treated by Peter McArdles, whose premises and their contents are described as exceedingly offensive. The gases escaping from the agitators or boiler render the atmosphere of the locality offensive.

The establishment of Walter Bownes, *in the woods*, between the old Astoria road and Greenpoint avenue, is found to be exceedingly offensive, a reeking nuisance, where horses are killed and their remains utilized.

A fertilizer factory building, the Carniola Chemical Company, is another nuisance described on page six of report marked C, where dead animals and the fertilizing product from them seem to be treated in the same reckless manner as regards the right of the people to a pure atmosphere.

At Flushing, near the railroad station on Grove street, five cow stables are found directly opposite to Main street depot.

Cars loading with manure were found occupying side tracks of the railroad at that place and giving forth offensive emanation.

The State Board of Health, through this committee, respectfully represents to your Excellency that the places and businesses here described in the reports now submitted from expert inspectors, who were employed at intervals in the district for the last six months, are nuisances detrimental to the public health, and offensive to the senses of hundreds of thousands of people.

The committee further represents, and formally expresses the opinion, that each and all of the nuisances herein described which shall continue to be offensive should be, within a limited period and as soon as practicable, wholly removed from railroads and other public thoroughfares over which numbers of passengers travel, and for the same reasons should be removed from the closely built-up streets, and the dwellings of those not engaged in the offensive business themselves.

This is the essential point in the practice relating to offensive trades, of businesses that are offensively conducted, as enunciated in the Second Annual Report of this Board, on pages 22 and 336.

The public accusation of noisome stenches and of all the causes that produce them is inevitable. Certain of the effluvium nuisances are themselves the most truthful and searching of all sanitary inspectors, for they reveal the sequestered deposits and neglects of putrefying materials, and it is idle to attempt to compromise between the senses and the offensive effluvia against which they rebel.

This is a protest of nature and must be respected.

The utilization of the waste of cities is a branch of the sanitary arts, and however rude some of the processes may be, they nearly all admit of being conducted in such manner as not to pollute the atmosphere and be offensive to the public. On the other hand they admit of being removed altogether, or to such a distance as to prevent public nuisance and detriment to the public health.

This being the case, it does not seem improper, and it will not work any permanent hardship, to recommend, as this committee now most respectfully does, that within a period to be designated, each of the places, businesses and persons mentioned in the appended list, should either

be found to be causing no offense or injury by stenches or otherwise, or thereupon at the expiration of the time mentioned should be required to remove (to a distance not less than shall be prescribed in each order) from any passenger railway, public ferry for passengers or from built up streets, dwelling grounds, premises or persons *not engaged in the trades* and businesses found to be thus offensive.

The committee has ample testimony to the fact that each source and cause of nuisance may best be treated by separate orders upon individuals and that before a peremptory order is issued for removal or for penalties, each person so concerned should be officially notified that such orders are impending wherever the accusations justly continue.

In every case in which complete removal of nuisance and future prevention are practicable, the order to so abate and prevent the evils and wrongs complained of must be closely followed up to satisfactory results.

The sources of stench nuisances in Brooklyn, E. D., will need to be separately and with equal faithfulness reported upon and reformed. They exceed in number and they equal in pungency the nuisances herein described. They admit of prevention. The health department of that city is now in official action to abate and prevent them.

The greatest of all the stench nuisances is Newtown creek itself, and it is necessary to enforce a rigorous sanitary supervision of that tidal estuary, and to prevent the defilement of it by sludge, oil, tarry matter and the waste products which produce stenches. Orders enforced under advice of the State Board and in certain instances by the Brooklyn board of health during the past two years, have been directed against this evil. All the petroleum refineries along the Brooklyn side of the creek are working under a strict guarantee "that neither spent acid nor any other offensive material used by, or the product of such refineries, shall be permitted to flow, leak or waste into or upon the ground or streams." The health department of Brooklyn is endeavoring to enforce strict compliance with this rule by all other kinds of business not included under this guaranty, and a night inspector and detective is employed by the State Board to aid in this district of offensive trades.

The annexed list of places and persons accused of causing stench nuisances in Queens county chiefly at Hunter's Point in Long Island City and in Newtown, along the line of the passenger railways, is submitted to you with specifications as a body of evidence.

On behalf and by order of the State Board of Health.

Very respectfully,

J. SAVAGE DELAVAN, *Chairman.*
ERASTUS BROOKS,
ELISHA HARRIS, *Secretary.*
Committee on Effluvium Nuisances.

A true copy of the report as adopted July 6, 1883.

Nuisances

Under accusation by Citizens and the State Board of Health.

(1.)

Manure flat boats along creek (Newtown), Long Island City, between railroad depot and Dutch Kills.

Long Island R. R. Co., 115 Broadway, New York; loaded manure cars on railroad adjacent to creek.

(2.)

Emil Calman & Co., 229 Pearl street, New York; varnish factory, 4th and West streets, Long Island City; E. Steiner, superintendent.

T. T. Lines, 817 S. 18th street, Philadelphia, Pa.; varnish factory, Front street between 4th and 5th streets, Long Island City; John Fick, superintendent.

James McGuiness; varnish factory, Western avenue between 4th and 5th streets, Long Island City; James McGuiness, superintendent.

Pratt, Lambert & Co., 110 John street, New York; varnish factory, 4th street between Front and West streets, Long Island City; H. C. Gordan, superintendent.

J. McGill & Co., New York Oil and Varnish Works, 5 Beekman street, New York; varnish factory, Western avenue between 6th and 7th streets, Long Island City; W. H. Dave, superintendent.

Meyer & Lowenstein, 80 Beekman street, New York; varnish factory, Flushing avenue, Long Island City; J. J. Morrissey, superintendent.

Edward Smith & Co., 158 William street, New York; varnish factory, 5th street between Front and West streets, Long Island City.

Seeley Bros., 32 Burling slip, New York; varnish factory, 6th street, Long Island City; G. W. Bailey, superintendent.

(3.)

Hornell & Valentine, 7 Spruce street, New York; printing ink factory, 9th street and West avenue, Long Island City; Robert Pollock, superintendent.

W. B. Wilson, 75 Fulton street, New York; printing ink factory, 10th street between West and Vernon avenues, Long Island City; J. MacNamara, superintendent.

H. D. Wade & Co., 117 Fulton street, New York; printing ink factory, Division street near Vernon avenue, Long Island City; E. Carney, superintendent.

(4.)

Eastern Distilling Co., 29 Broadway, New York; distillery and cow stables, at Blissville, both sides of the Long Island South Side R. R.; Col. Little, superintendent.

(5.)

Preston's Fertilizer Factory; bone boiling, bone burning, and fertilizer factory, on the right of railroad track and extending between it and Newtown creek, Long Island City.

(6.)

Kehoe's Fat Boiling; fat boiling, review avenue near to distillery; Mr. Kehoe, superintendent.

(7.)

Reid's Fertilizer Factory; superphosphate fertilizer factory between Penny bridge and Preston.

(8.)

Fred. Hoffner; rendering and bone boiling, below Penny bridge opposite Calvary cemetery near Newtown, Long Island City; Fred. Hoffner, superintendent.

Simon Steinfels; fat rendering, on Furman's island, Newtown creek, Newtown; Simon Steinfels, superintendent.

Kirkman & Sons, 30 Catharine street, New York; fat rendering, Furman's island, Newtown creek, Newtown; Mr. Kirkman, superintendent.

(9.)

John C. Muller & Co., bone black, Furman's island, Newtown creek, Newtown; John Muller, superintendent.

C. Meyer, 110 Wall street, New York; bone black factory, Furman's island; Mr. Meyer, superintendent.

(10.)

Henry Bereau; rendering dead animals, bone boiling, etc., Furman's island; Henry Bereau, superintendent.

(11.)

Geo. W. Baker, P. O. box 128, Brooklyn, E. D.; fertilizer factory, right hand side of railroad track between Grand street and Metropolitan avenue; Mr. Baker, superintendent.

(12.)

Long Island R. R. Co.; manure piles on railroad property adjacent to the track back of Fresh Pond station, on road to Jamaica; car-loads of manure standing on the side tracks.

(13.)

Benjamin Rosenzweig; rendering establishment, south side of Grand street, Newtown creek.

(14.)

George Ackerman; fat boiling, fish oil pressing, on the Flats, Newtown creek, between Grand street and Metropolitan avenue.

J. Briggs; fertilizer factory, on the Flats, Metropolitan, Newtown creek.

(15.)

J. Barnetts, 4 State street, New York; starch works, on the Flats, Newtown creek.

E. R. & R. B. Livermore, 119 and 121 Broad street, New York; starch works, on Metropolitan, near junction of Woodward avenue.

(16.)

Peter McArdle; fat boiling, near railroad, Flushing, West Woodside station.

(17.)

Walter Bowne; knackery for dead horses, woods between Old Astoria road and Greenpoint avenue, Woodside.

(18.)

Carniola Chemical Works; mixing scrap and other animal waste with chemicals in the manufacture of fertilizers near Woodside, Flushing Branch of railroad; O. S. Follett, superintendent.

SPECIFICATIONS.

1. The boats used in the manure transportation should be required to transfer their cargoes to the cars in the briefest periods and at fixed times, daily or nightly. The transfer to the cars should be at a place as far up the creek as the business will permit, in order to save passenger depot and the built up district of the cities from stenches. Deodorant disinfectants and absorbents should be freely used to cover the surface of the cargoes and car-loads as the State Board of Health may direct.

2. The boiling of oil and the exposure of melted gums and resins and varnish should be so managed as to have all their vapors, gases and odors drawn by aspiration through conduits directly into the furnace fires for entire combustion. The combustion apparatus should completely consume all gases, vapor and smoke pertaining to the business. The chimneys should extend much higher than they do. The hot kettles and vessels with varnish and other liquids should have their vapors and gases aspirated and burned, as here mentioned, and should not be allowed to dissipate them in the open atmosphere while the liquids are cooling.

3. The boiling of oils and other matters for ink should be so managed as to have all their vapors, gases and odors drawn by aspiration through conduits directly into the furnace fires for entire combustion. The combustion apparatus should completely consume all gases, vapor

and smoke pertaining to the business. The chimneys should extend much higher than they do. The hot kettles and vessels with oil, etc., should have their vapors and gases aspirated and burned, as here mentioned, and should not be allowed to dissipate them in the open atmosphere while the liquids are cooling.

4. The business of the Eastern Distillery Company as hitherto managed has been a perpetual nuisance on both sides of the Long Island railroad (south shore division). Unless entirely removed the storing of sour mash, swill or waste should be prevented. The stables should be renovated, cleansed and disinfected daily so as to cause no nuisance to railway travelers. The present nuisance is chiefly caused by gross neglect, and by failure of the local health authorities of Long Island City to exercise of proper control over these offensive premises.

5. The business of bone-boiling, bone-burning and the manufacture of fertilizers is in itself a nuisance in most of its branches. They should be entirely removed at an early day. It is practicable at considerable expense and with extreme vigilance for the manager to keep the premises in a far less offensive condition than they hitherto have been. The proprietors are intelligent and know what they can do to preserve absolute cleanliness at all times, to consume all vapor, gases and smoke, and to keep every thing disinfected and deodorized. It is a question of cost and great labor.

6. The business of Kehoe's fat boiling should be removed, as boiling fat in open kettles is a nuisance in the built up quarters like those he occupies, close by the highway and Calvary cemetery near the railway track.

7. The mixing of superphosphate fertilizers is under all circumstances a cause of stench nuisance, and should not be permitted to be carried on within close proximity to public highways or built up streets.

8. The place and mode of conducting the business of Fred. Hoffner are causing gross nuisances. The business should be wholly removed to a greater distance from human habitations and the public highways. He boils filthy materials in open kettles. The same recommendation is made in reference to the businesses of Simon Steinfels and Kirkman & Sons.

9. The bone-black factory of John C. Muller & Co. as now managed, and as such business is quite certain to be managed, is a nuisance which should be removed to a greater distance from public highways. The same recommendation is made in reference to the business of C. Meyer.

10. The business of Henry Bereau is upon the borders of two cities, but located in a town that has a valuable sanitary government. The business may be placed under executive orders.

11. The business of G. W. Baker should be removed far away from cities and villages as well as from passenger railways.

12. The Long Island Railroad Company should protect passengers and the environs of their stations and routes against this class of nuisances. The company can easily do so.

13. Rosenzweig's offensively managed business may be kept cleansed and disinfected; but it should be soon removed to some place distant from passenger railways and cities.

14. The place of George Ackerman must be kept cleansed and disin-

fected, until wholly removed from proximity to passenger railways, cities and villages. The same recommendation is made in reference to the business of J. Briggs.

15. The starch business can be conducted without any offense, and the owners and managers should be required so to conduct their works. The waste albuminous matter upon their premises, and in the sluggish ditches which float it off into Newtown creek, is a source of continued nuisance, detrimental to the public health.

16. The business of Peter McArdle, as managed, is a nuisance and should be suppressed unless immediately cleansed, disinfected and conducted as shall be required by the local sanitary authorities, approved by the State Board of Health.

17. The business carried on by Walter Bownes should be forbidden in the locality he occupies. The local board of health is competent to see that an executive order to this effect is strictly complied with. The premises should be cleansed, disinfected and covered with dry earth forthwith.

18. The premises of the Carinola Chemical Works should be cleansed and disinfected, as the local board of health, approved by the State Board, shall direct; or, be entirely removed within a specified time.

The foregoing schedule and specifications have been carefully derived from and compared with the various complaints, and the reports of skilled inspectors and are believed to be correct.

In the list, as herein specified, are comprised those nuisances, the causes of which, and the persons responsibly concerned for which, are not likely to be subjected to any sufficient degree of sanitary control by the local authorities within whose jurisdiction the premises are respectively situated. There are numerous minor nuisances not mentioned in the foregoing pages, which have been and will continue to be brought to the attention of local sanitary officials.

ELISHA HARRIS,
Secretary.

To the Governor of the State of New York:

The undersigned, having residences or places of business in the town of New Lots and being the members of the board of health of said town, beg leave to call your attention to certain things which, in the judgment of the undersigned, constitute a nuisance affecting the security of life and health as well as the value of property in said town, and call for executive action; namely, the noisome and offensive smells generated in the town of *Flatlands* and in the town of *Newtown* by certain establishments named in certain resolutions of your petitioners accompanying this petition, which said smells are brought into said town of New Lots by winds and other natural causes.

Your petitioners further represent that the local boards of health of said town of Flatlands and of said town of Newtown have failed to procure the abatement of said nuisances and that the same are, in the judgment of your petitioners, a proper subject for examination by the

State Board of Health under requisitions of the Executive, pursuant to chapter 322 of the Laws of 1880 and the acts amendatory thereof and supplementary thereto.

Your petitioners respectfully ask that such examination be required.

DITMAS JEWELL, *Supervisor,*
W. WATSON, *Justice of the Peace,*
WM. SHERLOCK, *Justice of the Peace,*
CHAS. GERTUM, *Justice of the Peace,*
LOUIS BIEDERMANN, *Town Clerk,*
JOHN S. ANDREWS, M. D., *Health Officer.*

NEW LOTS, *August* , 1883.

At a regular meeting of the health board of the town of New Lots, Kings county, held at the town hall, August 13, 1883, the following resolutions were unanimously adopted:

WHEREAS, The Atlantic Bone Works, so called, the property of Adams & Muns, located on Rockaway avenue near New Lots road in the town of Flatlands, at which place the business of bone black manufacturing is carried on. Also Whiting's Horse Factory, located immediately in rear of Adams and Muns' premises, whose business is the removal of dead animals under contract from the towns of Flatbush, New Lots and Flatlands, and James Lyons' Lamp Black factory and swill feed stables located near the Ridgewood reservoir in the town of Newtown, Queens county, has been investigated by the experts and officers of the State Board of Health; and

WHEREAS, The Secretary of said Board of Health, Dr. Elisha Harris, has addressed this board, stating that said business afore-mentioned is a nuisance and is dangerous to public health, and requesting this board to take action for the purpose of abating and removing said nuisance; and

WHEREAS, Said nuisance complained of is not within the jurisdiction of this board, but are located, to-wit:

Adams & Muns' factory in the town of Flatlands, Kings county; Whiting's factory at the same place, and James Lyons' in the town of Newtown, Queens county; and

WHEREAS, The board of health of said town of Flatlands, and the board of health of said town of Newtown, have neglected to take any measures to abate said nuisance; and

WHEREAS, In the judgment of this board said business is a nuisance as described by the said Board of Health, and, in the judgment of this board, it is necessary that legal proceedings against the said nuisance should be commenced; now, therefore, be it

Resolved, That this board does hereby authorize one of its members to present to the Governor of this State, pursuant to chapter 322 of the laws of 1880, a petition requesting the Governor to refer said nuisance to the State Board of Health for examination and report to him, and for such executive action as their said report, when made, shall seem to demand.

MATTER OF THE NUISANCES IN NEWTOWN, QUEENS CO.

CITY AND COUNTY OF NEW YORK, *ss.:*

Alexander S. Kirkman, being duly sworn, says, I am the active member of the firm of Kirkman & Son, mentioned in an order dated July 20, 1883; that order was received by me about the 25th day of July; I immediately caused the improvements mentioned in said order to be made, and ceased all work until they were made, which was on August 10, 1883. On September 18, 1883, I was served with a second order, when I immediately closed my place at Maspeth, and have done no work there since. I have complied with all the orders of his Excellency, the Governor of the State of New York, to the best of my ability. I desire to continue my business under such restrictions as may be proper. I, therefore, ask that the order of September 12 may be so modified that I may be permitted to continue my business or that another inspection may be made and the true condition of my place ascertained. ALEX. S. KIRKMAN.

Sworn to before me, this 1st day of October, 1883.

JOHN R. SMITH,
Notary Public, N. Y. Co.

CITY AND COUNTY OF NEW YORK, *ss.:*

Thomas Shannon, being duly sworn, says, I am in the employ of Kirkman & Son, and have charge of their premises at Maspeth, Long Island. On or about the first (1st) day of August, 1883, Mr. Kirkman gave me orders to do no more work until he had the kettle covered and other improvements in the apparatus made. No work was done by me, or at the place, until August 10, when the improvements were completed. On September 18 the place was closed, and no work has been done there since. THOMAS SHANNON.

Sworn to before me, this 2d day of October, 1883.

JOHN R. SMITH,
Notary Public, N. Y. Co.

CITY AND COUNTY OF NEW YORK, *ss.:*

Michael J. Mahoney, being duly sworn, says, I am a member of the firm of Mahoney Bros., carpenters, No. 52 New Bowery, New York; that on or about the third (3d) day of August, 1883, I received an order from Messrs. Kirkman & Son to make a cover for their rendering kettle at Maspeth, Long Island; that on the seventh (7th) day of August, I made the said cover and delivered the same to Messrs. Kirkman & Son. MICHAEL J. MAHONEY.

Sworn to before me, this 1st day of October, 1883.

JOHN R. SMITH,
Notary Public, N. Y. Co.

CITY AND COUNTY OF NEW YORK, *ss.:*

John Harlin, being duly sworn, says, I am a tin and iron worker and reside at No. 386 South First st., Brooklyn, E. D.; that on or about August first (1st), 1883, I received instructions from Messrs. Kirkman & Son to construct and attach a pipe from their fat rendering kettle at Maspeth, Long Island, with an apparatus for the combustion of the vapors of said kettle. I at once commenced to do the work and finished the same on the tenth (10th) day of August, 1883.

JOHN J. HARLIN.

Sworn to before me, this 1st day of October, 1883.

JOHN R. SMITH,
Notary Public, N. Y. Co.

ALBANY, *January* 8, 1884.

To HON. GROVER CLEVELAND, *Governor:*

DEAR SIR — This Board had the honor to receive from you last month, two appeals for the rescinding of the order made by you in July last, for the abatement of the nuisance connected with Mr. Fred. Hoffner's rendering and bone boiling factory, alongside the Long Island railroad and Newtown creek, opposite Calvary cemetery.

The dangerous illness of the chief inspector, A. Hollick, employed in the nuisance districts of Queens county, has prevented a final report to you on this subject until now.

Mr. Hollick's statements concerning each place that was served with orders from you, sir, have been received this morning. I beg leave to submit, for this Board, the following facts concerning the condition of the places recently occupied by Mr. Fred. Hoffner and by John Kehoe. Mr. Hollick says: "Fred. Hoffner has not yet rebuilt; he asked me to recommend that he should receive permission to re-establish his *plant;* he said it was promised; I, of course, refused to talk further with him. John Kehoe's establishment is closed; I am informed he has commenced working again at night."

It appears that Mr. Hoffner has not re-established his fat boiling business, and that Mr. Kehoe has begun to work his shop, which is close by Mr. Hoffner's, but whose business is different from Hoffner's in this respect, that it is simply the boiling of fat, while Hoffner's has ever been reported as a factory for boiling bones and rendering fats in open kettles; both places have ever been nuisances, offensive to thousands of persons daily, who pass over the railroad to and from the great consecrated burial place known as Calvary cemetery.

The accusation against the two places, like that against Preston's bone boiling and bone burning establishment and distillery stables, was based upon the offensiveness of the vapors, gases and smoke which escape from such factories and such open apparatus as were reported there.

The recommendation to you last July was that the business of Kehoe's fat boiling should be removed, as the boiling of fat in open kettles is a nuisance to built up quarters like those he occupies, close by the highway and Calvary cemetery, near the railroad track.

"Concerning Preston's fertilizer factory, his bone boiling, bone burning and mixing of fertilizers were at the same day reported to you by this Board, and yet it is a nuisance in most of its branches and should be entirely removed at an early day. It is practical, at considerable expense and with extreme vigilance, for the managers to keep the premises in a far less offensive condition than they hitherto have been. The proprietors are intelligent and know what they can do to preserve absolute cleanliness, at all times, to consume all vapor, gases and smoke, and to keep every thing disinfected and deodorized. It is a question of cost and great labor."

Concerning Mr. Fred. Hoffner's place and mode of conducting his business, the Board reported to you at the same day that they "were causing gross nuisances. The business should be wholly removed to a greater distance from human habitations and the public highways; he boils filthy materials in open kettles; the same recommendation is made in reference to the business of Simon Steinfels and Kirkman & Sons."

These three places and the business to which they are devoted cannot, without great expense and most intelligent and vigilant caretaking, be so managed as not to be nuisances. 1st. Because the business itself, in its different branches, is intensely offensive, unless provided for by mechanical and condensing and combustion methods, and apparatus which are costly. 2d. Because the intelligent and expensive supervision required in such management of those branches of business to prevent them from becoming gross nuisances against health and comfort is very unlikely to be given.

The actual ownership of the entire premises and water-front of the extensive works of the Preston Bros., and their entire ability to apply the necessary means of securing the requisite supervision of each branch of their business, warranted the recommendation which was made originally by this Board to you as herein quoted.

It may be proper for the State Board of Health to recommend to you, sir, that the same language which was used in the recommendation concerning Messrs. Prestons should be employed now concerning the premises and business of Mr. Hoffner and Mr. John Kehoe.

Only upon the one condition mentioned, concerning the Preston Brothers, can the continuance of such "*offensive trades*" *be justified.* The Board's committee on effluvium nuisances, therefore, expresses to you, by the Board's authority, its conviction that, if your order concerning these three several places is modified so as to permit the continuance of the work in any one or all of them, *identically the same terms concerning each* may need to be used, and *identically the same conditions* enforced *to prevent the recurrence of the nuisances* which have hitherto been complained of and found.

The foregoing circumstances being fully on record now in the Executive chamber, as well as in this Board's office, it is deemed most expedient and just thus to refer to the three factories which, in close proximity to each other, were producing common nuisances, that varied little from each other, and to recommend no easement for any one of the places and proprietors which shall not equally apply to each of these three factories.

Very respectfully submitted,
J. SAVAGE DELAVAN, *Chairman.*
ELISHA HARRIS.
Committee acting by order and with authority of the Board.

New Brighton, *February* 2, 1884.

To J. Savage Delavan, M. D., *Chairman Committee on Effluvium Nuisances:*

Sir — According to instructions received by me from the State Board of Health I have made inspections of the various nuisances in Queens county and the oil refineries of that and Kings county, L. I. Memoranda were taken as follows:

The oil refineries are mostly running at about half their capacity, work being very slack. The *Long Island* is almost at a stand-still. At *Pratt's* there has been a new bank of sixteen stills erected lately, and preparations are being made for an active trade. The *Eagle* was almost obliterated by a fire about two weeks since and is a complete wreck. This is now the only one of the fourteen refineries in this region which is not under the control of the Standard Oil Company. All the other refineries are in about the same condition as at the time of my last report, the greatest nuisance continuing to be that of the smoke. But very little oil or oily matter could be noticed in the vicinity of any one of them, and this was especially noted from the fact that it would have shown very plainly, owing to the snow and ice. It has been necessary to keep a tug-boat cruising up and down Newtown creek every day in order to keep the ice broken and prevent its freezing over solid.

Mayer & Loewenstein have completed their exhaust and condensation apparatus and now recover about fifteen to eighteen gallons of liquid per week, besides rendering their establishment almost odorless. Mr. Meyer hopes to still further improve their condensing part of the apparatus and expects it then to be a financial success. Too much praise and encouragement cannot be given to them for their perseverance and energy. I only wish that other firms engaged in the same business might show a like amount of zeal. The other ten varnish and printing ink factories I presume we may consider as off our list, and I have not visited them since the date of my previous report on the same.

Fred. Hoffner the fat boiler whose place was raided and burned down, has been after me on several occasions and begging permission to rebuild. While I am decidedly opposed to encouragement of this kind of a business, yet I must admit that it is a manifest injustice to debar him and yet to allow his near neighbor, *John Kehoe,* to work uninterruptedly and with open kettles. The latter individual, I am informed, works at night and also in the day-time, although I have never happened to catch him myself. It should be borne in mind that Hoffner promises to provide the most approved apparatus and to spare no expense, while Kehoe has done absolutely nothing in the way of improvement.

Another nuisance which has been entirely removed is the fat boiling establishment of *Kirkman & Sons.* The business is given up and the old rookeries are broken down with snow and ice.

J. & C. Muller & Co. have erected an entirely new plant, which is now in full working and is a model of its kind. The trade is bone-burning and this was formerly the most offensive place on Furman's island. It is now practically inoffensive, besides serving as a useful pattern for others to profit by.

Beraw's place is and seems likely to be the worst nuisance on Furman's island. There has been no change since my last report.

The only other places worth mentioning are the fat boiling establishment of *Benj. Rosenzweig* and the fertilizer works of *John Briggs*. The former evidently uses his old open kettle and the latter is mixing scrap and other animal matter with acid in defiance of the Governor's order. The neighbors complain of both places. In closing I would say that I have also inspected all the other places which were under executive orders, but find nothing worthy of mention. *Prestons* are still at their old spot, working full blast. They have presented plans for my consideration which propose the erection of an entirely new plant, containing every modern appliance for the control of offensive effluvia. If, as seems to be the case, it should not be possible to remove them entirely, I think it would be advisable to encourage the idea of the proposed improvements.

If fuller information is desired on any particular point I trust that I shall receive instructions to that effect. I write, presuming that my former reports are all accessible, and hence this report, when viewed alone, may seem somewhat vague.

Respectfully submitted,

ARTHUR HOLLICK,

Inspector.

LONG ISLAND CITY, *February* 19, 1884.

Hon. ERASTUS BROOKS, *Commissioner State Board of Health:*

SIR — According to instructions received from you on Saturday, February 16, 1884, I have inspected the entire series of nuisances in Queens county, which were under the Governor's orders.

The inspections were begun on Monday, February 18, and were completed this afternoon.

Thirty-two sources of nuisance were made subjects for Executive orders. The following is the list and memoranda in regard to each:

Varnish — eight establishments.

Meyer & Loewenstein have complied with the order in every particular and have now a model establishment. Condense all vapors and save product. They say the improvements will pay for themselves if all continues as well as expected.

T. T. Lines, *Edward Smith & Co.*, *Emil Coleman & Co.*, and *Pratt & Lambert* have done nothing.

James McGuiness is not working.

J. M. Gill & Co., and *Seeley Brothers* are such small establishments that they may be left out of the account.

Printing Ink — three establishments.

W. D. Wilson Printing Ink Company have made a few changes in their apparatus — enough to be considered as a compliance with order.

W. D. Wade and *Bonnell & Valentine* have not done any thing, but it was not thought worth while to press matters against these small establishments, I understand.

On or about September 23, 1883, I made a special report upon the above industries, which gives details, and since then, upon several occasions, I have reported the progress at *Meyer & Loewenstein's*, and sent sketches of the exhaust and condensing apparatus.

Dumping of night-soil, and transportation and storage of manure — two nuisances.

Both these sources of nuisance require to be *watched.* They may be apparent enough one day and totally absent the next. Considerable just complaint is made about the manure being loaded and allowed to stand on the cars in Long Island City.

Starch — two factories.

J. Barnett & Co. — Complied with orders in every respect.

E. R. & R. B. Livermore. — The situation of this factory precludes the possibility of doing much — being situated in a swamp — but they may be fairly said to have done what was possible.

Fat boiling and rendering — nine establishments.

George Ackerman. — Complied with the order; no nuisance.

Kirkman & Sons. — Closed the works and moved away.

Simon Steinfels. — Given up offal rendering, and only melts tallow occasionally; no nuisance.

Peter McArdle. — Complied with the order; no nuisance.

John Kehoe. — Could not find him at work, but complaint is made that he works at night or early morning. No attempt has been made to comply with the order.

Fred. Hoffner. — This place was burned down last autumn, but he is now rebuilding; promises to put in every improvement that can be suggested. John Kehoe is his near neighbor, and tells him he is a fool to go to so much expense.

Henry Berau. — No important change has been made, although the place is somewhat cleaner than on my last visit; perhaps a necessary nuisance.

Benjamin Rosenzweig. — Found this man rendering fat in his old open kettle and creating a terrible stench. Every one in the neighborhood complains; the passengers on the Grand street cars are particularly afflicted by it; a closed steam tank was put in last summer, but I have never seen it used; I doubt if it was intended to be used.

Walter Bownes. — Given up the business.

Distillery and cow stables — one establishment.

Eastern Distilling Company. — Complied with order.

Bone-black — two factories.

J. & C. Muller & Co. — Have put up a complete new plant, which is working now, but not entirely completed; an accident about two weeks ago almost burned the place down; when this has been repaired they say they will have the model establishment of the kind on Long Island; in about two weeks all will be in working order.

C. Meyer.— The only nuisance remaining here is due to the drying of wet scrap and bones. This will be remedied as soon as new tanks can be prepared. The disposition is manifested to do every thing required or suggested.

Fertilizers — five factories.

J. Briggs.— Did not find any work going on, but the presence of quantities of meat scrap, acid, mixed sludge and fertilizer showed that work had been done quite recently. People in the immediate vicinity complain that at times it is a great nuisance — a decided nuisance.

Geo. W. Baker.— Place very neat and clean and every thing possible done to prevent nuisance.

Reeds.— The only animal matter noticed was a little fish scrap. The rest of the material was phosphate rock and other inorganic matter. No nuisance.

Henry Elkins.— Has apparently stopped work. The place is closed and I could not get in.

Preston's.— No change made, either in their work or establishment. Propose to make an entirely new plant, on most approved principles.

This completes the list of thirty-two sources of nuisance which were brought under Executive orders. The only ones now remaining which are of any consequence are the following: Benj. Rosenzweig, John Briggs, John Kehoe, Prestons, Henry Berau.

The latter, however, has the contract for removing all dead animals from the city of Brooklyn, and hence his business is a public necessity, and any undue interference would not be in the interests of public health. His place should, however, be watched, and he should be required to keep it as clean as possible.

Prestons, if it is not possible to cause their removal, should be encouraged to build as they propose, and be given all the advice they ask for in relation to their improvements. The other three should be dealt severely with.

Respectfully submitted,
ARTHUR HOLLICK,
Inspector.

REPORT OF THE SANITARY COMMITTEE.

The chairman of the sanitary committee made the following report: Under chapter 292, of 1882, the following work has been accomplished. A careful comparison has been instituted between the instrument adopted by the State Board of Health, and the Tagliabue closed and open testers, about one hundred samples of oil having been purchased. The average difference between the State Board's tester and Tagliabue closed, is $17\frac{6}{10}$ Fahr., flush test. The average difference between the State Board tester and Tagliabue open is $29\frac{1}{10}$ Fahr. flash test. The average difference between Tagliabue's closed and open tester is $11\frac{1}{2}$ Fahr. on the flashing point, and the average difference between the closed and open tester on the burning point is $4\frac{4}{10}$ Fahr.

These comparisons were interesting as tending to show some regular connection between the tests used by the State Board of Health and by the oil dealers. The State Board of Health tester requires a higher standard in every case.

The sanitary committee further report, that the tester adopted by the State Board of Health has been adopted by the city of Brooklyn, the city of Buffalo, the cities of Albany and Rochester, and has just been adopted by the State of New Jersey, showing it has been gaining favor. The city of New York has not yet adopted it. The president of the board of fire commissioners of that city still prefers the Tagliabue instrument. He has an idea that the State Board's instrument is objectionable, because it requires more oil to make the test.

The following tables give the details of the comparison:

TABLE I.

No. of Sample.	Specific Gravity at 60° F. (E. G. Love.)	Flashing Point, S. B. H. tester, degs. F. (F. Hoffman.)	Flashing points by Tagliabue's closed and open testers. (Love.)		Burning points by Tagliabue's closed and open testers. (Love.)		Difference between S. B. H. tester and Tagliabue's open cup. Flashing Point.	Difference between S. B. H. tester and Tagliabue's closed cup. Flashing Point.	Difference between Tagliabue's closed and open cups. Flashing Point.	Difference between Tagliabue's closed and open cups. Burning Point.
			Closed cup.	Open cup.	Closed cup.	Open cup.				
3204	.806	84	105	118	140	138	34	21	13	2
3206	.807	84	102	116	139	136	32	18	14	3
3207	.804	89	107	120	141	137	31	18	13	4
3212	.804	86	106	120	140	138	34	20	14	2
3214	.805	86	104	114	140	136	28	18	10	4
3216	.806	88	105	117	142	137	29	17	12	5
3221	.807	86	105	116	141	135	30	19	11	6
3223	.806	85	104	116	137	130	31	19	12	7
3228	.808	87	105	118	140	138	31	18	13	2
3230	.805	92	112	120	145	140	28	20	8	5
3231	.810	92	110	122	145	138	30	18	12	7
3232	.811	89	106	118	142	136	30	18	12	6
3233	.807	88	106	118	141	136	29	17	12	5
3234	.806	88	105	117	141	135	30	19	11	6
3235	.806	86	105	116	140	136	29	18	11	4
3236	.809	88	106	117	142	138	26	17	9	4
3238	.806	90	107	116	145	140	31	14	17	5
3239	.807	91	105	122	140	136	27	16	11	4
3242	.807	92	108	119	144	139	30	19	11	5
3243	.806	87	106	117	143	139	25	17	8	4
3244	.808	95	112	120	144	142	29	19	10	2
3245	.808	88	107	117	142	135	31	19	12	7
3246	.805	86	105	117	141	132	28	16	12	9
3247	.804	96	112	124	146	142	28	16	12	4
3248	.807	94	110	120	144	140	26	16	10	4
3249	.794	98	118	130	151	144	32	20	12	7
3250	.804	91	108	121	140	137	30	17	13	3
3252	.807	95	114	124	144	140	29	19	10	4
3253	.805	95	109	121	142	136	26	14	12	6
3255	.805	94	112	124	141	137	30	18	12	4
3256	.808	87	105	117	142	138	30	18	12	4
3258	.810	85	103	117	137	132	32	18	14	5
3259	.807	87	102	114	140	137	27	15	12	3
3260	.802	92	108	116	146	138	24	16	8	8
3262	.793	96	110	124	144	142	28	14	14	2
3264	.805	92	110	120	144	140	28	18	10	4
3265	.807	88	107	119	142	138	31	19	12	4
3266	.805	87	105	116	142	138	29	18	11	4
3267	.807	88	105	115	140	135	27	17	10	5
3269	.807	89	107	120	139	137	31	18	13	2
3270	.803	91	110	122	144	140	31	19	12	4
3277	.805	92	108	120	142	138	28	16	12	4
3278	.805	92	110	118	144	140	26	18	8	4
3280	.807	89	103	115	139	139	26	14	12	0
3281	.806	84	106	118	141	138	32	22	12	3
3283	.810	87	106	119	143	137	32	19	13	6
3284	.806	95	114	126	150	142	31	19	12	8
3287	.806	88	102	112	140	137	24	14	10	3
3294	.806	92	110	120	142	140	28	18	10	2
3303	.802	94	110	123	142	138	28	16	12	4
Aver.	.8057	.....	....	....	....	...	29.1	17.6	11.5	4.38

Summary.— Average of fifty oils examined.

Average Specific Gravity = .8057.

Average difference between State Board of Health tester and Tagliabue's closed tester, 17.6° F.

Average difference between State Board of Health tester and Tagliabue's open tester, 29.1° F.

Average difference between Tagliabue's closed tester and Tagliabue's open tester, 11.5° F.

Average difference between Tagliabue's closed and open testers in determining the burning point, 4.4° F.

E. G. LOVE,
Public Analyst, New York.

April 30, 1883.

TABLE II.

Flashing Point — 321 *Samples of Kerosene Oil tested during the six months ending June* 30, 1883.

Oils flashing at temperature of laboratory (48° to 74° F.) No heat applied	7
Flashing at 74° F.	1
Flashing at 75° F.	6
Flashing at 78° F.	1
Flashing at 79° F.	1
Flashing at 83° F.	2
Flashing at 84° F.	4
Flashing at 85° F.	5
Flashing at 86° F.	13
Flashing at 87° F.	16
Flashing at 88° F.	14
Flashing at 89° F.	12
Flashing at 90° F.	6
Flashing at 91° F.	25
Flashing at 92° F.	14
Flashing at 93° F.	12
Flashing at 94° F.	5
Flashing at 95° F.	16
Flashing at 96° F.	3
Flashing at 97° F.	6
Flashing at 98° F.	4
Flashing at 99° F.	5
Flashing at 100° F.	10
Flashing at 101° F.	17
Flashing at 102° F.	54
Flashing at 103° F.	15
Flashing at 104° F.	20
Flashing at 105° F.	7
Flashing at 106° F.	1
Flashing at 107° F.	4
Flashing at 109° F.	1
Flashing at 110° F.	3
Flashing at 112° F.	2
Flashing at 113° F.	1
Flashing at 114° F.	1
Flashing at 118° F.	1
Flashing at 122° F.	1
Total tested	316

TABLE II.—*Continued.*

Number of oils which stood the test	138
Number of oils below the test	178
Not tested *	3
Samples lost, bottles broken in transit	2
Total	321

The samples were purchased in various localities, in over thirty different towns. There were curious differences between particular towns, one dealer would supply one neighborhood, a different dealer would supply another. The following table shows the localities where the oil was procured, the number of samples that stood the test, and the number that fell below standard:

TABLE III.

Samples of Kerosene Oil tested during the six months ending June 30, 1883.

PLACE.	Samples collected.	Number that stood test.	Number below standard.	Not tested.
Albany	8	6	2	
Alden	6	2	4	
Attica	10	5	5	
Avon	1	1	.....	
Bath	2	2	.....	
Bergen	4	1	3	
Binghamton	6	4	2	
Buffalo	16	12	4	
Canandaigua	3	2	1	
Cohoes	8	6	2	
East Albany	4	4	.....	
Elmira	6	6	.....	
Greenbush	8	7	1	
Green Island	2	2	.....	
Holley	5	.....	2	†3
Lansingburgh	5	5	.....	
Lima	5	1	4	
Lockport	14	9	5	
Medina	5	3	2	
Middleport	6	3	3	
New York	101	1	100	
Owego	4	4	.....	

* These three samples reserved as duplicates, for use in court.
† Three (3) samples reserved as duplicates for use in court.

TABLE III.—*Continued.*

PLACE.	Samples collected.	Number that stood test.	Number below standard.	Not tested.
Potsdam	2	2	.....	
Rochester	31	5	26	
Syracuse	*24	20	3	
Troy	*25	15	9	
Utica	2	2	.....	
Waterford	5	5	.....	
West Troy	3	3	.....	
Total	321	138	178	3

*Two (2) samples lost in transit.

One accident investigated by Mr. Colby was due to the explosion of a kerosene stove. It seriously burned the proprietor of the establishment and its contents.

Three hundred and twenty-one samples of oil have been tested during the past six months. I present a tabular statement, showing the character of these oils; 138 of these oils complied with the test established by the State Board of Health; 178 were below the test, and quite a number of them flashed at the ordinary temperature of the atmosphere without being warmed.

It will be seen by the above table, that one sample purchased at Avon stood the test; of four samples purchased at East Albany, all were up to standard; of six purchased at Elmira, all stood the test; also two from Green Island and five from Lansingburgh four purchased in Owego, two in Potsdam, two in Utica, and five in Waterford, all came up to the legal standard. On the other hand, in Alden, more than half the samples fell below the test; in Attica, half were below, while in New York city, out of 101 samples, only one stood the test; in thirty-one samples from Rochester, twenty-six were below test; in twenty-four samples from Syracuse, twenty stood the test; in twenty-five samples from Troy, fifteen stood the test. Out of 321 samples collected, 138 stood the test and 173 fell below it.

The amount of work performed by each analyst is shown in the following table.

TABLE IV.

Number of Oils tested by each Analyst during the six months ending June 30, 1883.

ANALYST.	District.	Samples tested.	Samples not tested.
Doctor E. G. Love	Southern	203	
Doctor F. Hoffman	Southern	100	
Doctor W. G. Tucker	N. E. or Central.	78	*1
Doctor S. A. Lattimore	Western	133	*1
Mr. A. L. Colby		2	†3
Total		516	5
Deduct for repetition on same samples		200	
Total		316	
Not tested		5	
Number of samples collected		321	

There were in all 516 samples tested, although there were actually only 321 samples collected. The difference is explained by the fact, that some of the tests, on the same samples, were duplicated.

The character of the oil depends largely upon the party furnishing it. Some companies have agreed to and do furnish good oil. The following table shows the party who furnished the oil:

TABLE V.

Classification of Oils collected by Inspector A. L. Colby, during his trip through the State in April, 1883.

NAME OF FIRM.	Address.	Total No. samples collected in different cities.	Stood test 100° F.	Below standard 100° F.	Flashing points of those below standard.
Branches of Standard Oil Company:					Degrees.
J. A. Cook	Auburn	2	2	...	
Star Oil Company	Buffalo	21	19	2	93, 85.
Acme Refinery	Cleveland	1	..	1	93.
Elmira Oil Company	Elmira	8	7	1	99.
Vacuum Oil Company	Rochester	5	5	....	
Syracuse Oil Company	Syracuse	13	13	....	
J. M. & C. B. Crouse	Utica	1	1	....	
Johnson & Murray	Utica	1	1	....	
Total		52	48	4	

* Two samples lost in transit.
† These three samples reserved as duplicates for use in court.

TABLE V.—*Continued.*

NAME OF FIRM.	Address.	Total No. samples collected in different cities.	Stood test 100° F.	Below standard 100° F.	Flashing points of those below standard.
Other Oil Companies:					
Bean & Company	Binghamton	3	3	....	
Binghamton Refining Company	Binghamton	1	..	1	99.
Buffalo Lubricating Oil Company	Buffalo	4	3	1	95.
Cynthia Oil Works	Buffalo	2	2	....	
Lootz, Holmes & Adams	Buffalo	3	2	1	97.
Magenta Refining Company	Buffalo	1	..	1	97.
Bradford Oil Company	Bradford, Pa.	1	1	....	
Moore & Collier	Lockport	3	..	3	75, 75, 75.
Blye, Sanger & McNeil	Syracuse	4	4	....	
Miners Oil Company	Syracuse	7	4	*2	98, 98.
Rice, Robinson & Witherop	Titusville, Pa	9	6	3	95, 97, 99.
L. C. Paine	Wilkes Barre, Pa.	1	1	...	
Bradner & Company	Williamsport, Pa.	2	1	1	89.
Bought of N. J. Nobles of Batavia at—					
Wyoming county	Attica	4	..	4	74, 75.
Wyoming county	Attica				75, 87.
Erie county	Alden	4	..	4	75, 91.
Erie county	Alden				95, 95.
Orleans county	Holley	1	..	1	68.
Livingston county	Lima	2	..	2	78, 79.
Niagara county	Middleport	4	1	3	75, 93, 95.
Total		56	28	27	

From Auburn, Buffalo, Cleveland, Elmira, Rochester, Syracuse and Utica, fifty-two samples were purchased, all supplied by different branches of the Standard Oil Company; forty-eight of these were up to the standard and four were below. Of the four latter, one was ninety-nine degrees, two were ninety-three degrees, one was eighty-five degrees.

Eight different works were represented. Of the other samples furnished by about sixteen to eighteen different firms, one-half of them were below standard.

A test case under the law was brought to trial. Col. Prentice, at the request of the district attorney, went to Batavia and took charge of the case. Dr. Lattimore, Mr. Colby and Dr. Love appeared as witnesses and secured a verdict. Four other cases were instituted against parties for selling dangerous oil in Rome. The cases were called at Utica at an usuitable time, our witnesses being at Batavia then, could not appear, and so the cases stand over. The parties, however, have all been indicted.

An attempt was made to secure indictments for selling adulterated oils in Troy, but without success; the grand jury there did not indict.

It is necessary that the State Board of Health should have somebody to represent it in such cases, otherwise I do not think we can succeed with these suits in the State. The failure at Troy is a good illustration. If we are merely represented by district attorneys, who are lawyers with little experience in such matters, we will not be very successful.

*One lost.

Under chapter 407, of 1881, the sanitary committee reports having purchased 183 samples of goods during the past six months; thirty-eight were found to be pure; seventy-one adulterated, and seventy-four not yet reported upon by chemists. The following tables give the details. They include quite a variety of articles, butter, cheese, cinnamon, cream of tartar, oleomargarine, saleratus, sugar, tea, etc.

TABLE VI.

Samples of food purchased during the six months ending June 30, 1883.

ARTICLES.	Pure.	Adulterated.	Total analyzed.	Not reported.	Total purchased.
Allspice				2	2
Baking powder				2	2
Baking soda	1		1		1
Bartlett pears				1	1
Butter				9	9
Butterine	1		1	1	2
Catsup	1		1		1
Cheese	3		3		3
Cinnamon				1	1
Cloves				2	2
Coffee, ground	3	3	6	12	18
Cream of tartar	17	2	19	18	37
Lard	6		6		6
Mustard				2	2
Oleomargarine				1	1
Olive oil				1	1
Peas, canned	1		1		1
Pepper				3	3
Pickles				2	2
Saleratus				1	1
Succotash				1	1
Suine				1	1
Sugar				6	6
Tea	4	66	70	8	78
Tomatoes, canned	1		1		1
	38	71	109	74	183

We have not found adulterated sugar thus far for sale in this State.

Of drugs, sixty-four samples have been purchased; thirty-one were pure, eleven adulterated, and twenty-two were not examined.

The following table illustrates these details:

TABLE VII.

Samples of drugs purchased during the six months ending June 30, 1883.

ARTICLES.	Pure.	Adulterated.	Total analyzed.	Not reported.	Total purchased.
Bismuth, subnitrate of	.....	.....	.....	1	1
Dandelion root	.....	2	2	4	6
Magnesia, citrate of	21	7	28	4	32
Magnesia, heavy calcined	.....	.....	.....	1	1
Nitre, spirits of	.....	.....	.....	2	2
Potash, bromide of	.....	.....	.....	1	1
Sulphur	10	2	12	9	21
	31	11	42	22	64

The food and drugs were purchased in Albany, Buffalo, Lockport, New York, Rochester, Syracuse and Utica. Table showing these facts is here given.

TABLE VIII.

Food and drugs purchased during the six months ending June 30, 1883.

NAME OF CITY OR TOWN.	Samples, food.	Samples, drugs.	Total purchased.
Albany	7	.....	7
Buffalo	7	4	11
Lockport	3	.....	3
New York	108	44	152
Rochester	9	.....	9
Syracuse	40	11	51
Utica	9	5	14
	183	64	247

The amount of work performed by the analysts is shown in the following table, giving the distribution of the work of analyzing samples purchased in 1883.

TABLE IX.

Samples of food and drugs referred to the public analysts during the six months ending June 30, 1883.

ANALYST.	FOOD.		DRUGS.		Totals.	
	Reported.	Not reported.	Reported.	Not reported.		
Dr. E. G. Love	94	7	.....	.....	Reported	94
					Not reported .	7
Dr. F. Hoffman....	12	.....	42	2	Reported	54
					Not reported .	2
Dr. W. G. Tucker..	8	8	.....	5	Reported	8
					Not reported .	13
Dr. S. A. Lattimore..	.....	59	.....	15	Reported	..
					Not reported .	74
	114	74	42	22		252
Deduct for repetition of analysis on same sample. ..						5
Total number of samples collected.						247

The following table shows samples purchased in 1882 and reported in 1883.

TABLE X.

Samples of food and drugs collected in 1882, and reported during the six months ending June 30, 1883.

ANALYST.	FOOD.		Drugs, Pure.	Total.
	Pure.	Adulterated.		
Dr. E. G. Love.....	Allspice 6	Butter 4	Tartaric acid.. 9	
	Chicory extract. 1	Cinnamon 1		
	Cloves..... 2	Cloves..... 1		
	Ginger 2	Coffee extract .. 2		
	Pepper 3	Pepper..... 3		
	Tea 1	Tea..... 1		
	15	12	9	36
Dr. W. G. Tucker	Cream of tartar.. 3	Cream of tartar.. 1		
	Baking powder.. 3	Baking powder.. 2		
	6	3		9
Dr. S. A. Lattimore...	Allspice 1			
	Ginger..... 1			
	Mustard. 1			
	3			3
				48

With regard to the samples purchased in 1882 and not reported on the 1st of January, the following table will explain.

TABLE XI.

Samples of food and drugs collected in 1882, *and not reported up to June* 30, 1883.

ANALYST.	Food.	Drugs.	Total.
Dr. S. A. Lattimore....	Allspice ..... 8 Baking soda..... 1 Cinnamon ..... 7 Cloves..... 7 Coffee extract..... 1 Kaoka..... 1 Mace..... 1 Pepper 9	Jalap root..... 2 Rhubarb root..... 2 Sarsaparilla root..... 1 Spanish saffron 3	
	35	8	
			43
Dr. F. Hoffmann.....	Cream of tartar..... 1		1
			44

The following table shows the samples purchased in 1883, and still in the analyst's hands.

TABLE XII.

Samples of food and drugs collected in 1883, *and not reported up to June* 30, 1883.

ANALYST.	Food.	Drugs.	Total.
Dr. E. G. Love.....	Butter..... 4 Butterine..... 1 Oleomargarine..... 1 Suine..... 1		
	7		
			7
Dr. F. Hoffmann.....		Dandelion root..... 1 Magnesia, citrate of 1	
		2	
			2
Dr. W. G. Tucker.....	Cream of tartar..... 5 Sugar..... 1 Tea..... 2	Dandelion root..... 1 Magnesia, citrate of ..... 2 Nitrous ether, spirits of..... 1 Sulphur (Lac)..... 2	
	8	5	
			13
Dr. S. A. Lattimore....	Allspice..... 2 Baking powders.... 2 Bartlett pears..... 1 Butter..... 5 Cinnamon..... 1 Cloves..... 2 Coffee..... 12	Bismuth, subnitrate of..... 1 Dandelion root..... 2 Magnesia, citrate of ..... 2 Magnesia, heavy calcined.... 1 Nitrous ether, spirits of.... 1 Potash, bromide of ..... 1 Sulphur (Lac)..... 7	

TABLE XII.—*Continued.*

ANALYST.	Food.	Drugs.	Total.
	Cream of tartar..... 13 Mustard..... 2 Olive oil..... 1 Pepper ..... 3 Pickles ..... 2 Saleratus ..... 1 Succotash..... 1 Sugar..... 5 Tea..... 6		
	59	15	74
Total not reported in 1883			96

TABLE XIII.

Samples of Food and Drugs.

	Reported in 1883.		Still on hand.	
Love.....	94 36	130	7	7
Hoffman.....	54	54	2 1	3
Tucker.....	8 9	17	13	13
Lattimore.....	3	3	74 43	117
		204		140

TABLE XIV.

Prosecutions under Food and Drug Act.

Cases.	Indicted.	Convicted.
Cream tartar.....	17	1
Coffee.....	2	2
Mustard.....	4	4
Lac Sulphuris.....	1	1

TABLE XIX.

Samples of potable water examined—Description of samples June 30, 1883.

No.	Source.	Town or city.	County.	From whom received.	Analyst.
8,024	Well of water-works...	Binghamton..	Broome..	Dr. J. G. Orton	Dr. Tucker.
8,025	River—intake pipe....	Binghamton..	Broome..	Dr. J. G. Orton	Dr. Tucker.

TABLE XX.

Analyses of potable waters, June 30, 1883—parts in 100,000.

Number.	Appearance in two foot tube. Color.	Odor when heated to 100° F.	Chlorine in chlorides.	Phosphoric acid in phosphates.	Nitrogen in nitrates and nitrites.	Free ammonia.	Albuminoid ammonia.	Oxygen absorbed at 80° F.		Hardness equivalent to carbonate of lime.		Total solids dried at 220° F.	Conclusion.
								In 15 minut's.	In 4 hours.	Before boiling.	After boiling.		
8,024	Clear. Very slight greenish tint.....	None.	0.56	None.	0.34	0.0040	0.0062	.....	.....	10.0°	4.7°	12.80	Uncertain.
8,025	Clear. Very slight greenish tint.....	None.	0.32	None.	0.61	0.0032	0.0104	0.0432	0.0986	5.7°	5.0°	8.00	Uncertain.

The sanitary committee reported the decision of Judge Cowan against the Board. The position was considered untenable. The judge took the ground that, in order to secure conviction, you must prove a guilty knowledge on the part of the seller of the adulterated article. There were other suits for adulterated coffee, in which conviction was secured, also four for selling adulterated mustard, resulting in the same way.

In regard to milk, the Board appointed Messrs. Martin and Munsell State Inspectors of milk, to serve without pay. During the first quarter of the year they examined milk of 250 different parties, sometimes two or three of one party. The presence of the inspectors had improved the quality of the milk. Several parties were prosecuted for selling adulterated milk, and seven men were put under bonds, to be tried in Orange county.

Condensed milk was also examined to ascertain if it was modified in any way. Ten samples were analyzed. Some of the milk had been thinned to some extent, before concentrating. A creamery is, as a general thing, a fraud on the community. The very idea of a creamery is antagonistic to society. Preserved milk differs from condensed milk in name only. Eight samples of it had been analyzed. These investigations have thus far been carried on under the law to prevent the adulteration of food and drugs.

Water.— Under this head, two analyses have been made, both by Dr. Tucker. The water came from Binghamton. The results were not satisfactory. The water was not very good and not very bad, and it was difficult from the analysis to determine whether the water was dangerous or not.

In conclusion, the committee reported that this work, wherever it had been brought to the attention of the public, had given great satisfaction. There was no work that the Board could carry on that would give it more credit in the eyes of the community than the prosecution and conviction of the persons found selling dangerous oils, or adulterated food and drugs. One conviction exercised an influence over a great area. A few more convictions secured, and the State would be safe. The committee recommended the Canada plan of having a tariff of prices for analyses.

REPORT

ON THE

MANUFACTURE OF NEUFCHATEL CHEESE AND ITS ADULTERATIONS, AT THE FACTORIES OF CHARLES H. GREEN, CHESTER, ORANGE COUNTY, AND LAWRENCE & DURLAND, CHESTER, ORANGE COUNTY, BY EDWARD W. MARTIN, STATE INSPECTOR OF MILK.

REPORT.

128 WORTH STREET, NEW YORK,
November 10, 1883.

ELISHA HARRIS, M. D., *Commissioner and Secretary :*

SIR.— According to your letter of instruction, dated October 22, 1883, I reported to Dr. H. A. Pooler, at Goshen, Orange county, on Thursday, October 25, 1883, and was informed by him, that he wished an investigation made of the Neufchatel cheese made by Charles H. Green and by Lawrence & Durland, both factories being at Chester, Orange county; accordingly, I have the honor to make the inclosed report.

Very respectfully,
EDWARD W. MARTIN,
State Inspector of Milk.

NEW YORK, *November* 10, 1883.

ELISHA HARRIS, M. D., *Commissioner and Secretary :*

SIR — I have the honor to make the following report on the Neufchatel cheese made at the factories of Charles H. Green and of Lawrence & Durland, both factories being situated in the town of Chester, Orange county :

Factory of Charles H. Green — Method of Manufacture.

The milk is run into vats, warmed and the caseine coagulated in the usual way. The resulting curd is slightly pressed, and is then formed into cheeses weighing about five ounces each. These are rubbed with salt, allowed to dry for a few hours, covered with paper and tin-foil, packed in boxes, marked "Neufchatel cheese," and are ready for market.

Mr. Green has no machines at his factory, for the admixture of foreign fats or oils, and I was informed by him, that he used milk alone in the manufacture of Neufchatel cheese; 100 pounds of milk producing twelve to fourteen pounds of cheese.

A sample of such cheese was taken and analyzed with the following result : Water, 51.30 per cent; fat, 28.33 per cent; sugar and caseine, 17.67 per cent; ash, 2.70 per cent.

The insoluble fatty acids in the fat, obtained from the same sample of cheese, amounted to 87.991 per cent; specific gravity of the fat, at 100° F., was .9124.

The microscopical examination of the cheese did not show any adulteration. *From the foregoing facts, I should pronounce this sample of cheese, made at the factory of Charles H. Green, at Chester, Orange county, to be pure,* and, as far as I could learn, nothing but milk is used at his factory in the manufacture of Neufchatel cheese. He is now making and selling about 3,000 cheeses, weighing about five ounces each, per day.

This inspection was made, and the sample of cheese was obtained on October 26, 1883.

Factory of Lawrence & Durland — Method of Manufacture.

The milk is skimmed and is run into the emulsifier, where it is mixed with lard in the usual manner. (See Second Annual Report of the State Board of Health of New York, report G. C. Caldwell, Ph. D., page 530.)

The emulsified milk is now run in vats, the caseine coagulated, the curd pressed, and made into cheeses weighing about five ounces each. They are then rubbed with salt, dried for a few hours, covered with paper and tin-foil, packed in boxes, marked, "NEUFCHATEL CHEESE," and are ready for market.

I was shown by Mr. Durland the emulsifier, the lard used, and was informed by him that *one and one-half* pounds of lard were mixed with *one hundred* pounds of skimmed milk, and that this mixture produced from *twelve to fourteen* pounds of cheese.

Samples of the cheese and of the lard used in its manufacture were taken and analyzed with the following result:

Analysis of the cheese: Water, 57·19 per cent; fat, 17·60 per cent; sugar and caseine, 21·46 per cent; ash, 3·75 per cent.

Analysis of the fat from this sample: Insoluble fatty acids, 93·98 per cent; specific gravity of the fat at 100° F. ·90674.

From the foregoing facts I should pronounce this sample of cheese made at the factory of Lawrence & Durland at Chester, Orange county, to be adulterated, and that this adulteration consisted of lard, and that in the process of manufacture, at least seventy-five per cent of lard was substituted for the butter fat.

As far as I could learn, all of the cheese, called Neufchatel cheese, made at this factory was adulterated with lard.

The microscopical examination showed no other adulteration.

Analysis of the lard: Insoluble fatty acids, 95·462 per cent; specific gravity of fat at 100° F. ·90503.

Lawrence & Durland are now making and selling about 5,000 cheeses, each weighing about five ounces, per day.

These samples were obtained and the inspection made on November 2, 1883.

No sample of milk used in the manufacture of the cheese was obtained, as at both visits to this factory the skimmed milk used was too acid for analysis.

From a large number of analyses, made by me, of Orange county milk, both skimmed and pure, I found the average pure milk consisted of: water, 87·5; fat, 3·5; solids not fat, 9·0; and of skimmed milk: water, 90·45; fat, 0·50; solids not fat, 9·05.

Respectfully submitted,

EDWARD W. MARTIN,
State Inspector of Milk.

STATE OF NEW YORK, }
City and County of Albany, }

On the 4th day of December, 1883, before me personally appeared Edward W. Martin, to me known, who, being by me duly sworn, deposed and said, that the report hereto attached addressed to Dr. Elisha Harris, bearing date November 10, 1883, is and the statements therein contained are true to his knowledge.

EDWARD W. MARTIN.

Subscribed and sworn to before me, December 4, 1883. }

GEORGE M. WRIGHT,
Notary Public, Albany County, N. Y.

NEW YORK, *January* 4, 1884.

ELISHA HARRIS, M. D., *Secretary and Commissioner:*

SIR — We have the honor to report the following work performed by us in the service of the State Board of Health for the year 1883;

Number of milk inspections	2,400
Number of specimens examined	40,000
Number of analyses	120
Number of arrests	6
Number of days employed	180
Lowest specific gravity of pure milk examined at 60° F.	1·03016
Highest specific gravity of pure milk examined at 60° F.	1·03422
Average specific gravity of pure milk examined at 60° F.	1·03161
Lowest per cent of cream in pure milk	12
Highest per cent of cream in pure milk	18
Average per cent of cream in pure milk	14

Constituents of average milk:

	Per cent.
Water	87·5
Fat	3·5
Caseine	4·1
Sugar	4·3
Ash	0·7

In the adulterated milk examined:	
Highest per cent of added water	25
Lowest per cent of added water	3
Average per cent of added water	12
Highest per cent of cream removed	95
Lowest per cent of cream removed	5
Average per cent of cream removed	20

Names of persons arrested or indicted under chapter 407 of the Laws of 1881.

Under arrest awaiting indictment. Dwight W. Berry, Circleville, eighty-two per cent of cream removed; D. H. Thompson, Campbell Hall, eleven per cent of added water; D. H. Thompson, Campbell Hall, fifteen per cent of cream removed.

Under indictment. Wm. P. Uptegrove, Edenville, eighty-four per cent of cream removed; Abm. Swarthout, Port Jervis, twenty-two per cent of cream removed; Wm. Sheenan, Lake, thirty-three per cent of cream removed; Alfred Tower, Campbell Hall, twenty-five per cent of cream removed; Jas. McGowan, Circleville, nine per cent of added water; Chas. Clark, Hampton, twenty-four per cent of added water.

These results were obtained from the milk produced in the counties of Orange, Delaware, Sullivan, Ulster, Westchester and Dutchess.

The inspection was confined to these counties and more particularly to the county of Orange in the endeavor of the State Board of Health to assist the New York city health department to keep out of that city the large quantities of adulterated milk sent daily to the New York market. This inspection, to which the aid given to the inspectors by the railroads was of the greatest importance, was conducted in the following manner.

The milk was inspected, at irregular intervals, on the milk trains, at the depots, farms and creameries, and wherever any person was detected in the act of selling or offering for sale adulterated milk, their arrest, or indictment, under chapter 407 of the Laws of 1881, was procured.

The result of this was that the city dealers were afraid to buy skimmed or partly skimmed milk, they knowing that your inspectors being constantly on the watch were, therefore, cognizant of the quality of the milk received by them, and that they would be liable under the Sanitary Code for bringing such milk into the city.

And the shipper of adulterated milk was, for a similar reason, deterred from sending such milk, he knowing that he would be liable under the State law. The result was that the sale of at least 40,000 quarts of adulterated milk daily was prevented.

As to the adulterants used, coming within the meaning of the law, your inspectors found that water and skimmed milk constituted at least 95 per cent of them.

A few cases where small quantities of salt had been added, were detected.

Upon information sent us by Dr. Newton, State inspector of milk for New Jersey, we informed Dr. Bartley, the Brooklyn inspector, that

a producer was shipping milk to Brooklyn, to which had been added a certain preservative containing borax and soda. This Dr. Bartley detected.

But in the majority of cases we are of the opinion that water and skimmed milk will be the principal adulterants, except during very hot weather, when doubtless various preservatives will be used.

Now when we take into consideration the fact that three-fourths of our infant population in cities are brought up on cow's milk, the immense importance of a pure and fresh article of milk is at once seen. Although the local authorities may be most vigilant, still a great source of adulteration is beyond their control.

The benefit derived by the citizens of the State from the inspection of milk under the direction of the State authorities cannot be over estimated, as their jurisdiction is not limited, and they are able to get at the very source of the adulteration. The adulteration of milk is so easy and the detection of the crime so difficult, that only the most vigorous methods can prevent it.

The adulterator, being able to sell his product at a cheaper rate, actually drives the honest man to commit the same offense.

That a thorough and systematic inspection of not only the milk, but the cows producing it, the manner in which they are treated and fed, the food and water supplied them, and their condition, and also the various products made from milk, is of the greatest importance to the health of the citizens of this State, cannot be denied.

Respectfully submitted,

EDWARD W. MARTIN,
CHARLES E. MUNSELL,
State Inspectors of Milk.

MILK, FRESH AND CONDENSED.

By C. E. Munsell, Ph. B.

The causes that have been found to affect the quality of milk are breed, age, food, treatment, housing, drainage, purity of water supply, health of the cow, time of the calving and the sanitary conditions of the dairy.

These causes have not been as thoroughly investigated as desirable on account of lack of time, and that the summer is not the most suitable season for the examination of the effects of food, such as brewers' grains, starch and glucose refuse, etc., on the quality of the milk produced, so that the results given in this report may be modified by future investigations as the above causes of deterioration of quality are so intimately connected, that it is difficult to determine which, of several causes, is the one that causes the greatest decrease in quality in any particular dairy examined. The fatty constituent of milk is considered the most valuable, and as its removal, wholly or in part, is the principal form of adulteration (except the addition of water) that is practiced, the question of what causes affect this constituent before the milk is removed from the animal is of the utmost importance, so

as to determine whether a sample of milk, with a small percentage of fat, has been produced by the abuse of the cow herself or by human agency after the milk has been drawn from the animal.

The most natural causes that affect the quality of milk are breed and the age of the animal; that these affect the percentage of fat when all other causes that produce a decrease of that constituent are eliminated is shown by the following analyses of the milk from the cows of the dairy belonging to Mrs. N. D. Woodhull, near Monroe, Orange county; these cows, twenty-eight in number, were fed entirely on pasture at the time of inspection (the afternoon of July 21st) and had been during the two months previous; they were treated kindly and the stable where they were housed was clean, well drained and dry. These cows whose milk was examined were of half Holstein breed with the exception of the last, which was entirely of that breed; the only four year old cow that was examined, as the herd was almost entirely composed of young stock, gave milk of the best quality, those two and three years of age of half Holstein breed gave milk of good quality and average quantity, with the exception of cow No. 6, which gave a larger flow of poorer milk, while the thoroughbred Holstein gave a very large flow (thirteen pounds by actual weight) of very poor milk, but whether this was an exception to other cows of the same age and breed has not been determined as yet.

Table No. 1.

Farm of Mrs. N. D. Woodhull, near Monroe, Orange county, twenty-eight cows in herd; treatment, kind; housing, clean and dry; food, pasture; breed, Holstein. Afternoon of July 21, 1881.

Number.	COLOR.	BREED.	Age of cow.	Number of times calved.	Time of last calving.	Quantity of milk given.	Temperature. Degrees.	Lactometer.	Analysis.			
									Water.	Fat.	Caseine and sugar.	Salts.
1	Black and white	Half Holstein	2 years	1	First of April.	6 qts.	60⅛	107	87.48	3.68	8.08	.76
2	Mottled	Half Holstein	2 years	1	Last of April.	5 qts.	60	107	87.25	3.84	8.25	.70
3	Black	Half Holstein	2 years	1	April	4 qts.	60	108	87.12	3.68	8.47	.73
4	Black and white	Half Holstein	2 years	1	February	6 qts.	60	109	87.54	3.49	8.20	.77
5	Black with white tail	Half Holstein	3 years	2	March	4 qts.	60	109	86.63	3.82	8.80	.75
6	Black	Half Holstein	3 years	2	March	7 qts.	60	112	87.34	3.32	8.63	.71
7	Yellow	Half Holstein	4 years	3	March	5 qts.	60	104	86.18	4.55	8.60	.67
8	Black	All Holstein	2 years	1	First of April.	13 lbs.	60½	101	88.76	2.78	7.78	.68
	Average of eight analyses						60	107	87.29	3.64	8.35	.72

Maximum percentage of fat, 4.55; minimum, 2.78.

The question of the feed given to the cows is of the greatest importance and is very difficult to solve on account of the numerous conditions evolved, as the dairyman who wishes to feed his cattle on a cheap food, that will produce a large flow of milk, will not be over zealous with regard to the sanitary condition of his stables, the purity of the water supply nor the health of the cows milked.

The foods that have been so far examined are brewers' grains or the barley from which the malt has been extracted; starch feed, or the refuse of the corn from starch and glucose factories; and barley sprouts, or the chaff from winnowed malt. As no milk is raised in or brought to New York city that is produced from cows fed on distillery swill, no samples for analysis could be obtained; but as there is no question with regard to the injurious effects of this refuse on the health of the cow, and as the excretion produced by its use from the stimulated mammillary glands is unworthy of the name of milk, its use as feed for cattle should be prohibited, more from the sanitary and prevention of cruelty to animals aspects of the question, than from its effects on the milk as shown by chemical analysis.

Brewers' Grains.

The results of analyses made of the milk produced by cows fed on brewers' grains show that if they are mixed with other feed, such as chopped hay, Indian meal and bran in not too large a proportion, the milk produced is of good quality; but if the cows are fed on these grains exclusively, or to a great extent, the milk produced is of extremely poor quality, sometimes containing only two-thirds as much fat as ordinary milk. This decrease in the quality of milk of cows of the same dairy is gradual, but after six months or a year, the change is apparent, and seems to increase with the time; but as the cows lose flesh on this feed, it is customary for the dairyman to sell his cows to the butcher and purchase new stock. As the sanitary regulations of these dairies are generally not over-good, the question that drainage, cleanliness, etc., produced these results is introduced, and should be considered as assisting in lowering the quality of the milk. Care should be taken with brewers' grains, that they are not allowed to decompose; they should be packed in pits and kept tight.

The same remarks refer to starch feed or glucose meal (these are the same article); it should not be fed to cows exclusively, nor be allowed to spoil by exposure.

If as little care were taken with the best corn or grain, as of these refuse feeds, it would decompose as easily.

TABLE No. 2.

Farm of Edward B. Brady, near Prudy's, Westchester county; fifty cows in herd; treatment, careful; housing, clean and dry; food, pasture with five quarts per night of starch feed and brewers' grains to each cow; in winter, mixed with cut hay and meal; date of inspection, afternoon of August 11.

Number of cow.	BREED.	Age of cow.	Number of times calved.	Time of last calving.	Number of quarts given.	Temperature.	Lactometer.	ANALYSIS.		
								Water.	Fat.	Casein, sugar and salts.
						Degrees.				
1. ..	Common or native...	4 years	2	July	5	62	119	86.87	3.29	9.84
2. ..	Common or native	7 years	5	February	8	60	114	87.06	3.27	9.67
3....	Common or native....	6 years	4	March	6	60	111	87.08	3.63	9.29
	Average of three analyses....					60	114.6	87.00	3.40	9.60

Maximum percentage of fat, 3.63; minimum, 3.27.

TABLE No. 2 — (*Continued*).

Farm of John H. Knight, Monroe, Orange county; twenty-six cows in herd; treatment and housing, good; food, pasture and starch feed (three quarts to each cow, night and morning); date of inspection, July 22, 1881.

Number of cow.	BREED.	Color of cow.	Age of cow.	Number of times calved.	Time of last calving.	Number of quarts given.	Temperature.	Lactometer.	ANALYSIS.			
									Water.	Fat.	Casein and sugar.	Salts.
							Degrees.					
1....	Half Alderney..	Drab	3 years	1	Last of April	8	60½	107	88.48	2.75	8.01	.76
2.....	Half Alderney.....	Brown and white..	5 years . ..	2	March.....	9	60	109	87.76	3.16	8.40	.68
	Average of two analyses						60	108	88.12	2.95	8.21	.72

Maximum percentage of fat, 3.16; minimum, 2.75.

TABLE No. 3.

Farm of Alfred Todd, near Peekskill, Westchester county, twenty-two cows in herd; eight dry; treatment, good; housing, clean and dry; food, pasture, with six quarts per day of brewers' grains to each cow. These brewers' grains were dried by packing tight in a bin, and pressing with boards, so that they were not decayed. Date of inspection, afternoon of September 22.

No. of cow.	BREED.	Age of cow.	Number of times calved.	Time of last calving.	Number of quarts given.	Temperature, degrees.	Lactometer.	ANALYSIS.		
								Water.	Fat.	Caseine, sugar and salts.
1	Common or native	6 years.	4	March..	8	60	104	88.54	2.77	8 69
2	Common or native	4 years.	2	August.	6	60	114	87.66	2.81	9.53
3	Common or native	9 years.	7	March...	6	60	114	87.47	3.01	9.52
4	Common or native	3 years.	1	January .	6	60	112	85.76	4.34	9 90
5	Common or native	7 years.	5	March....	5	60	107	86.08	4.58	9.34
	Average of five analyses					60	109.4	87.10	3 50	9.40

Maximum percentage of fat, 4.58; minimum, 2.77.

TABLE No. 4.

Stable of Charles Paulus, Eighty-first street and Avenue A, New York; ten cows in stable; treatment, ordinary; housing, dirty not drained; food, hay, brewers' grains. Afternoon of November 16.

Number of cow.	BREED.	Age of cow.	Number of times calved.	Time of last calving.	Number of quarts given.	Temperature, degrees.	Lactometer.	ANALYSIS.			
								Water.	Fat.	Caseine and sugar.	Salts.
1.....	Common or native.....	5 years.	3	May	4	60	111	84.23	5.32	9 74	.71
2....	Common or native.....	4 years.	2	March.....	3	60	112	86.54	3.58	9.28	.60
	Average of two analyses..					60	111.5	85.38	4.45	9.51	.66

Maximum percentage of fat, 5.32; minimum, 3.27.

TABLE No. 4 — (*Continued*).

Stable of John Moloney, 413 East One Hundred and Seventeenth street, New York city; six cows in stable; treatment, good; stable under barn, light and clean; food, grass, bran and hay, the same as fed to horses. Date of inspection, afternoon of September 10.

Number of cow.	BREED.	Name of cow.	Age of cow.	Number of times calved.	Time of last calving.	Number of quarts given.	Temperature, degrees.	Lactometer.	ANALYSIS.		
									Water.	Fat.	Casein, sugar and salts.
1....	Common or native	Jennie.	5 years	3	February...	6	60	108	85.80	4.43	9.77
2....	Common or native.....	Nellie..	4 years	2	March	6	60	108	87.56	3.16	9.28
	Average of two analyses.....						60	108	86.68	3.79	9.53

Maximum percentage of fat, 4.43; minimum, 3.16.

Table No. 5.

Farm of Benjamin Westfall, Port Jervis, Orange county; twelve cows in herd, nine milked; treatment and housing, ordinary; food, glucose meal and hay. Morning of April 21.

Number of cow.	BREED.	Age of cow.	Number of times calved.	Time of last calving.	Number of quarts given.	Temperature, degrees.	Lactometer.	Analysis.			
								Water.	Fat.	Caseine and sugar.	Salts.
1	Impure Ayrshire	12 years.	9	January	4	59	115	88.36	2.74	8.19	.71
2	Impure Ayrshire	10 years.	7	December	4	58½	107	87 64	3.67	7.98	.71
3	Impure Ayrshire	6 years.	4	February	6	58	109	87 16	3.76	8.41	.67
	Average of three analyses					60	110 3	87.72	3.39	8.19	.70

Maximum percentage of fat, 3.76; minimum, 2 74.

TABLE No. 5 — (*Continued*).

Farm of Benjamin E. Cuddeback, Port Jervis, Orange county; forty cows in herd, twenty-six milked; treatment and housing, good; food, hay, and glucose meal kept in silo, six to seven quarts per cow daily. Morning of April 21.

Number of cow.	BREED.	Age of cow.	Number of times calved.	Time of last calving.	Number of quarts given.	Temperature, degrees.	Lactometer.	ANALYSIS.			
								Water.	Fat.	Caseine and sugar.	Salts.
1...	Common or native	8 years.	6	July	4	58½	106	87.90	3.41	7.97	.72
2....	Common or native	8 years.	5	December	6	59	114	87 35	3.42	8.55	.68
3....	Common or native	11 years.	8	March 1	8	59½	113	87.88	2.93	8.51	.67
4....	Common or native	9 years.	6	December	6	59	117	86 91	3.65	8.74	.70
	Average of four analyses					59	112.5	87.51	3.35	8.44	.70

Maximum percentage of fat, 3.65; minimum, 2.93.

TABLE No. 6.

Farm of Michael Fitzsimmons, Carpenter's Point near Port Jervis; fifteen cows in herd, twelve milked; ordinary treatment; cows kept in shed; food, wheat bran and middlings, hay in morning, cut oat straw at night. Morning of April 26.

Number of cow.	BREED.	Age of cow.	Number of times calved.	Time of last calving.	Number of quarts given.	Temperature, degrees.	Lactometer.	ANALYSIS.			
								Water.	Fat.	Caseine and sugar	Salts.
1	Common or native	5 years.	3	March 19	5	59	111	87.96	3 10	8.24	.70
2	Common or native	5 years.	2	January	4	59½	113	87.07	3.39	8.91	.63
3	Common or native	5 years.	3	March 1	5	59	113	87.82	2.87	8.68	.62
4	Common or native	10 years.	7	March 25	4	59⅛	111	87.93	2.89	8.53	.65
5	Common or native	5 years.	3	March 15	4	59⅛	111	87.59	3.45	8.29	.67
6	Common or native	13 years.	10	March 15	6	59	114	87.50	3.01	8.76	.73
	Average of six analyses					59⅛	112 2	87.69	3.12	8.57	.67

Maximum percentage of fat, 3 45; minimum, 2.87.

Table No. 7.

Farm of Mrs. David Hanion, Florida, Orange county; seventeen cows in herd; thirteen milked; treatment, good; housing, clean and dry; food, barley sprouts, pasture and meal. Afternoon of May 19.

No. of cow.	BREED.	Color.	Name of cow.	Age of cow.	Number of times calved.	Time of last calving.	Number of quarts given.	Temperature degrees.	Lactometer.	Analysis.			
										Water.	Fat.	Caseine and sugar.	Salts.
1	Common or native.	Mottled.....	White Band.	8 years.....	5	January ..	3	61½	104	85.45	5.38	8.45	.72
2	Common or native....	Dark brown..	Long Legs ...	11 years.....	8	February ...	6	60	102				
3	Common or native	Mottled.....	Club Foot .	6 years.....	4	February ...	4	62	107				
4	Common or native.....	Mottled.....	Hard Tack...	6 years.....	4	March.....	5	60	102				
5	Common or native.	Brown	Brindle.....	11 years.....	8	February ...	5	60	104				
6	Common or native.....	Light brown.	Big White ...	11 years.....	8	March.....	6	60	105				
								61½	104	85.45	5.38	8.45	.72

The preceding analyses were made from samples taken from cows that were seen milked, the entire production of each cow, which was thoroughly milked, was well mixed, strained into a clean and dry vessel, cooled, and brought to the laboratory in a perfectly clean, dry and sealed bottle, and immediately analyzed.

The following analyses are of commercial milk, that is, of several cows mixed together, raised in the vicinity of New York, and brought immediately to the city for sale; the cows being fed on brewers' grains.

TABLE No. 8.

Milk produced from cows fed on brewers' grains — Vicinity of New York city.

Number.	NAME.	Address.	Temperature Degrees, F.	Lactometer.	ANALYSES.			
					Water.	Fat.	Caseine and sugar.	Salts.
1	Bernard Benjamin	Union Hill, N. J.	60	111	87.78	2.91	8.68	.63
2	Myers Rosenberg	363 Hamburg avenue, Brooklyn	60	103	88.15	3.06	8.13	.66
3	John E. Hegeman	Bushwick, Kings county	60	115	87.14	3 24	8 96	.66
4	John E. Hegeman	Bushwick, Kings county	60	114	87.03	3.36	8 97	.65
5	John Brady	Flatbush, Kings county	60	108	87.17	3.38	8.83	62
6	John Brady	Flatbush, Kings county	61	103	87.16	3.74	8 45	.65
7	Louis Salsberg	Hoboken, N. J.	60	112	87.81	3.58	8.92	.69
Maximum, fat, 3.74; minimum, 2.91.		Average of seven analyses	60	109 4	87.32	3.32	8.71	.65
		More distant points in the State.						
8	S. C. Sutton	Bedford, Westchester county	61	113	88.23	2.94	8.08	.75
9	S. C. Sutton	Bedford, Westchester county	60	120	87.49	2.97	8.76	.78
10	A. Knapp	Lake, Orange county	60½	111	87.85	3.07	8.38	.70
11	A. Knapp	Lake, Orange county	60	109	87.64	3 23	8 43	.70
12	A. Houston	Stone Bridge Orange county	60	110	87.78	3.13	8.43	.66
Maximum, fat, 3.23; minimum, 2.94.		Average of five analyses	60	112.6	87.79	3.07	8.42	.72
		From cows fed on starch feed or glucose refuse.						
13	John H. Thomson	Monroe, Orange county	60	108	88.19	2.84	8.24	.73
14	David D. Houston	Middletown, Orange county	60	113	87.23	3.41	8.62	.74
Maximum, fat, 3.41; minimum, 2.84.		Average of two analyses	60	110.5	87.71	3.13	8.43	.73

TABLE No. IX.

Summary of Analyses of Unadulterated Milk.

NAME OF PRODUCER.	Number of cows.	Lactometer at 60° F.	FAT.		AVERAGE ANALYSES.			
			Maximum.	Minimum.	Fat.	Water.	Caseine and sugar.	Salts.
Mrs. N. D. Woodhull	8	107	4.55	2.78	3.64	87.29	8.35	.71
Alfred Todd	5	109.4	4.58	2.77	3.50	87.10	9.39	Included with caseine.
Edward B. Brady	3	114.6	3.63	3.27	3.40	87.00	9.60	Included with caseine.
John H. Knight	2	108	3.16	2.75	2.96	88.12	8.20	.72
Charles Paulus	2	111.5	5.32	3.58	4.45	85.38	9.51	.66
John Moloney	2	108	4.43	3.16	3.79	86.68	9.53	Included with caseine.
Benjamin Westfall	3	110.3	3.76	2.74	3.39	87.72	8.19	.70
Benjamin E. Cuddeback	4	112.5	3.65	2.93	3.35	87.51	8.44	.70
Michael Fitzsimmons	6	112.2	3.45	2.87	3.12	87.64	8.57	.67
Mrs. David Henion	1	104	5.38	5.38	5.38	85.45	8.45	.72
City from brewers' grains	7	109.4	3.74	2.91	3.32	87.32	8.71	.65
State from brewers' grains	5	112.6	3.23	2.94	3.07	87.79	8.42	.72
State from glucose meal	2	110.5	3.41	2.84	3.13	87.71	8.43	.73
Average	50	110.3	5.38	2.74	3.41	87.32	9.27	Included with caseine and sugar.

STATISTICS OF MILK COMING TO NEW YORK CITY, BROOKLYN AND VICINITY.

Summary by Railroads.

	Cans.	Gallons.
New York, Lake Erie and Western Railroad	4,238	42,880
New York, Ontario and Western Railroad	631	6,310
Middletown and Crawford Railroad	250	2,500
New York, Susquehanna and Western Railroad	1,180	11,800
New York Central and Hudson River Railroad	100	1,000
Newburgh, Dutchess and Connecticut Railroad	350	3,500
Steamer "Monitor," from Peekskill, etc	350	3,500
New York and Harlem Railroad	1,945	19,450
New York City and Northern Railroad	556	5,560
New York, New Haven and Hartford Railroad	1,038	10,380
New Jersey Central Railroad	400	4,000
Morris and Essex Railroad	300	3,000
New Jersey and New York Railroad	30	300
Pennsylvania Railroad	70	700
Long Island Railroad	250	2,500
New Jersey (conveyed in wagons)	60	600
Staten Island (conveyed in wagons)	40	400
Produced in Westchester Co. (conveyed in wagons).	200	2,000
Produced in Kings county	100	1,000
Produced in New York city (298 cows)	200	2,000
Total daily production during August, 1881	12,288	122,880

Totals by States.

	Cans.
New York	9,798
New Jersey	1,368
Connecticut	885
Massachusetts	237
	12,288

All comes to New York city, except that *via* Long Island Railroad.

STATIONS IN NEW YORK STATE FROM WHICH MILK IS SHIPPED TO NEW YORK CITY.

New York, Lake Erie and Western Railroad, July 18, 1881.

	Cans of milk.	Cream.
Monticello, New York	....	3
Barnum's, New York	16	....
Mahwah, New Jersey	4	....
Southfield, New York	3	....
Turner's, New York	54	....
Monroe, New York	237	10
Oxford, New York	141	....
Chester, New York	145	1
Otterkill, New York	43	....
Goshen, New York	218	17
Hampton, New York	232	....
Middletown, New York	110	41
Howell's, New York	135	1
Otisville, New York	169	....
Guymard, New York	67	....
Shin Hollow, New York	15	....
Central Valley, New York	24	....
Highland Mills, New York	34	....
Woodbury, New York	10	....
Mountainville, New York	13	....
Craigville, New York	66	....
Blooming Grove, New York	*59	....
Washingtonville, New York	269	10
Salisbury, New York	54	....
Vail's Gate, New York	*29	....
New Windsor, New York	6	....
Erie proper	2,153	83
Kipp's, New York	41	1
Campbell Hall, New York	225	22
Neely Town, New York	18	....
Beaver Dam, New York	5	....
Montgomery, New York	152	10
Montgomery Branch	451	33
Bennett's, New York	51	....
Orange Farm, New York	45	....
Houston, New York	32	6
Big Island, New York	51	....
Florida, New York	177	5
Pine Island, New York	96	42
Pine Island Branch	452	53

* 101 boxes; 11 boxes; 9 boxes. Total, 121 boxes.

	Cans of milk.	Cream.
East Chester, New York	9	....
Sugar Loaf, New York	69	1
Lake , New York	70	4
Durland's, New York	37	5
Stone Bridge, New York	54	....
Warwick, New York	112	16
Warwick Valley Railroad	351	26
Sandford's, New York; New Milford, New York; Dekay's, New Jersey; Rutherford, New Jersey; Vernon, New Jersey; Campbell's, New Jersey; Sandy Hill, New Jersey; and McAfee, New Jersey	211	9
Total Erie Branches	1,465	121
Walden, New York	22	....
Shawangunk, New York	20	....
New Hurley, New York	17	....
Gardiner, New York	67	....
Forest Glen, New York	46	....
New Paltz, New York	11	....
Walkill Valley Railroad	183	....
Fox Hollow, New York	9	....
Big Indian, New York	11	....
Summit, New York	22	.. .
Arkville, New York	72	....
Halcottsville, New York	12	....
Roxbury, New York	56	17
Grand Gorge, New York	12	....
More's Crossing, New York	41	....
South Gibbon, New York	28	....
Stamford, New York	95	8
Ulster and Delaware Railroad	437	25

Totals.

Erie proper	2,153	81
Erie branches	1,465	123
Walkill Valley Railroad	183	....
Ulster and Delaware Railroad	437	25
	4,238	229

New York, Ontario and Western Railroad, August 15, 1881.

	Cans of milk.
Sands', New York	4
Crawford Junction, New York	36
Fair Oaks, New York	18
Purdy's, New York	19
Lockwood's, New Jersey	23
Winterton, New York	38
Bloomingburgh, New York	58
Wurtsboro, New York	2
Summitville, New York	12
Mountain Dale, New York	3
Dugall's, New York	16
Centreville, New York	33
Fallsburgh, New York	42
Hurley, New York	63
Gardiner, New York	25
Parliman, New York	9
Strongtown, New York	25
Liberty Falls, New York	12
Gerow, New York	15
Liberty, New York	35
Parksville, New York	25
McGrath, New York	17
Finkle, New York	8
Morsstown, New York	3
Cook's Falls, New York	3
Hancock, New York	5
Griffis, New York	5
Rock Rift, New York	3
Walton, New York	5
Marwin's, New York	2
Colchester, New York	4
Hawley's, New York	17
Hamden, New York	15
De Lancey, New York	11
Delhi, New York	13
Total	631

Middletown and Crawford Railroad. Daily average for August, 1881.

	Cans of milk.	Cream.
Pine Bush, New York	65	27
Thompson Ridge, New York	50	.....
Bullville, New York	54	16
Circleville, New York	81	14
	250	57

New York, Susquehanna and Western Railroad — Stations in New York State for July 15, 1881.

	Cans of milk.	Cream.
Unionville, New York	122	37
Waterloo, New York	46	.....
West Town, New York	206	1
Rutgers', New York	10	.....
Johnson's, New York	108	.....
Wawayanda, New York	40	.....
Slate Hill, New York	136	.....
Spring Side, New York	24	.....
Stations in New York State	692	38
Stations in New Jersey	388	42
New York, Susquehanna and Western Railroad	1,080	80
Middletown and Crawford Railroad	250	57
New York, Ontario and Western Railroad	631	.....
Total	1,961	137

New York and Harlem Railroad — July 29, 1881.

	Cans of milk.
White Plains, New York	23
Kensico, New York	4
Unionville, New York	4
Pleasantville, New York	15
Chappaqua, New York	23
Mount Kisco, New York	52
Bedford, New York	82
Katonah, New York	124
Golden's Bridge, New York	122
Ferser Platform, New York	44
Somers Center, New York	88
Lake Mahopac, New York	58
Prudy's, New York	57
Croton Falls, New York	26
Brewster's, New York	23
Dickman's, New York	25
Towner's, New York	83
Patterson, New York	220
Pawling's, New York	199
South Dover, New York	99
Dover Furnace, New York	28
Dover Plains, New York	48
Wassaic (all condensed), New York	148
Amenia, New York	51
Sharon, New York	61
Coleman's, New York	66
Millerton, New York	41

	Cans of milk.
Mount Riga, New York	10
Boston Corners, New York	9
Connecticut Western Railroad, Conn	76
Lebanon Springs Railroad, New York	11
Poughkeepsie and Boston Railroad, New York	25
Total	1,945

New York Central and Hudson River Railroad.

	Cans.
Stuyvesant, Comstock and Fort Plain, New York	50
Peekskill Landing, Sing Sing, Rhinebeck, etc	50
Total	100

Steamer "Monitor" — Peekskill to Thirty-fifth street, New York.

	Cans.
Sing Sing Landing	150
Croton Landing	50
Peekskill	150
Total	350

Newburgh, Dutchess and Connecticut Railroad — By Steamer "William Tittermer," to Thirty-fifth street, New York, September 6, 1881.

	Cans of milk.
Brinckerhoff, New York	14
Hopewell, New York	4
Clove Branch Junction, New York	30
Sylvan Lake, New York	20
Lagrange, New York	7
Billings, New York	12
Moore's Mills, New York	18
Verbank, New York	25
Millbrook, New York	21
Shunpike, New York	2
Bangall, New York	9
Stissing, New York	9
Attleburg, New York	17
Pine Plains, New York	43
Shekomeko, New York	39
Total from Dutchess county	270
Cornwall, from Temple Hill	80
Total	350

New York City and Northern Railroad, August 13, 1881.

	Cans of milk.
Elmsford, New York	12
Tarrytown Heights, New York	1
Whitson's, New York	7
Merritt's, New York	31
Croton Lake, New York	68
Yorktown, New York	120
Amawalk, New York	68
West Somers, New York	33
Baldwin's, New York	46
Mahopac, New York	23
Craft's, New York	22
Carmel, New York	125
Total	556

Long Island Railroad.

	Cans.
Locust Valley, New York	16
Glen Cove, N. Y.	5
Glen Head	31
Greenville, N. Y.	40
Roslyn, N. Y.	22
Albertson, N. Y.	12
Williston, N. Y.	18
Mineola, N. Y.	4
Hicksville, N. Y.	25
Syosset, N. Y.	15
Westbury, N. Y.	30
Northport, N. Y.	16
Smithtown, N. Y.	13
South Oyster Bay, N. Y.	3
Total	250

Morris and Essex Railroad.

McAfee, Hamburgh, Franklin, Monroe, Sparta, Branchville, Augusta, Lafayette, Newton, Andover and Whitehall on the Sussex Railroad; Madison, Morristown, Morris Plains, Rockaway, Dover and Drakesville on the Morris and Essex Railroad; in all about 300 cans.

New Jersey Central Railroad.

Annadale, Lebanon, Clinton, Whitehouse and other stations; in all about 400 cans.

New York, New Haven and Hartford Railroad.

	Cans.	Boxes.
Housatonic Railroad	587	27
Shepang Railroad	289	45
Danbury & Norwalk R. R	42	.....
Naugatuck Railroad	162	11
Total from Connecticut and Massachusetts	1,038	83

Housatonic Railroad, August 15, 1881.

	Cans.	Boxes.
Stepney, Conn	3	.....
Botsford, Conn	10	.....
Newtown, Conn	8	.....
Hawleyville, Conn	5	.....
Brookfield, Conn	12	.....
New Milford, Conn	51	5
Merwinsville, Conn	32	.....
Kent, Conn	38	.....
Cornwall Bridge, Conn	84	.....
West Cornwall, Conn	67	14
Lime Rock, Conn	7	.....
Falls Village, Conn	23	.....
Canaan, Conn	10	.....
Ashley Falls, Mass	21	.....
Sheffield, Mass	131	8
Barrington, Mass	13	.....
Glendale, Mass	3	.....
Stockbridge, Mass	24	.....
Lee, Mass	7	.....
Lenox Furnace, Mass	6	.....
Dewey's, Mass	17	.....
Pittsfield, Mass	15	.....
Total	587	27

Shepang Railroad, August 15, 1881.

	Cans.	Boxes.
Litchfield, Conn	48	39
Bantain, Conn	35	6
Morris, Conn	33	.....
Rumford, Conn	30	.....
New Preston, Conn	14	.....
Washington, Conn	106	.....
Roxbury, Conn	33	.....
Total	289	45

Danbury and Norwalk Railroad.

	Cans.
Stamford, Conn	2
Danbury, Conn	10
Sanford's, Conn	17
Reading, Conn	7
Branchville, Conn	4
Georgetown, Conn	2
Total	42

Naugatuck Railroad.

	Cans.	Boxes
Winstead, Conn	31	.....
Burrville, Conn	20	11
Torrington, Conn	35	.....
Rye, N. Y.	34	.....
Total	162	11

The preceding statistics show that the daily consumption of milk during the summer is about 123,000 gallons, or nearly 500,000 quarts. This retails at from six to ten cents per quart, the average price being over seven cents, or more than $35,000 per day. In former times it was customary to add one-fourth for water sold with the milk, but those halcyon days (for milk dealers) have passed. The average lactometric standing for 1,514 samples (tested in 1880) in 1,136 different stores being 106 degrees (all samples of skimmed milk being omitted) in about one-fourth of New York city; the lactometer ranged from 72 to 116 degrees, but only 16 were sufficiently bad to have the sellers fined, although ninety more samples stood between ninety-six and ninety-nine.

TABLE No. 10.

Lactometer standings of specimens of milk sold in stores in New York city; the temperatures of these samples were taken and the standing at 60° F. calculated (all skimmed milk omitted).

LACTOMETER AT 60° F.	NUMBER OF SPECIMENS.			
	1880.	1881.	1882.	Total.
72	1	.....	.....	1
76	1	.....	.....	1
79	1	.....	.....	1
80	1	.....	.....	1
81	1	1	.....	2
82	.....	.....	1	1
83	1	.....	2	3
84	2	.....	.....	2
85	4	1	.....	5
86	2	.....	.....	2
87	2	.....	2	4
88	9	1	1	11
89	2	1	2	5
90	9	1	3	13
91	6	.....	2	8
92	10	4	4	18
93	2	3	5	10
94	15	6	3	24
95	10	5	14	29
96	22	3	13	38
97	20	6	18	44
98	25	13	18	56
99	21	6	32	59
100	64	43	37	144
101	66	20	47	133
102	67	37	90	194
103	61	56	97	214
104	80	61	125	266
105	87	75	143	305
106	102	108	141	351
107	116	91	177	384
108	122	114	161	397
109	126	111	158	395
110	119	89	121	329
111	94	101	114	309
112	84	77	98	259
113	56	32	67	155
114	45	25	49	119
115	30	8	19	67
116	18	3	7	28
117	5	4	4	13
118	1	3	.....	4
119	2	.....	.....	2
120	2	1	.....	3

YEAR.	Number of specimens.	Average lactometer.	Average specific gravity.	Specimens below 100° = 1.029.
1880.....	1,514	106·12	1·03078	167 = 11·0 per c'nt
1881.....	1,110	107·06	1·03105	51 = 4·6 per c'nt
1882.....	1,775	106·26	1·03081	120 = 6·7 per cn't
1880, 1881, 1882..	4,399	106·41	1·03085	338 = 7·7 per c'nt

These are not comparable, as the district was different each year.

The farmers receive two cents per quart in the summer, two and one-half to three in the spring and fall, and three to three and one-half, rarely four, in winter; the freight is usually forty or forty-five cents per can, or one cent per quart, and five cents for returning the empty can; the ferriage is seventeen cents for one-horse wagons and twenty-five cents for two-horse trucks; therefore, the milk costs the wholesale dealer three and one-half cents per quart in summer and four to four and one-half cents in winter, which he sells to stores at from four to five cents in summer, and from five to six in winter; and the retailer in the store sells the milk to the consumer for from six to ten cents; the usual quantity sold in the grocery stores is fifteen to twenty-five, sometimes forty or more quarts daily; but as the demand is generally more for quantity than quality, the temptation to lengthen the supply is only counteracted by the fear of the Board of Health; the retailer with his wagons sells his milk at eight to ten cents per quart without any middle man as he carts his own milk from the railroad.

About one can in forty comes to the city watered, the statistics from the latest night inspections being thirty in 1,500 condemned and destroyed at the Harlem depot, and twenty-three in 700 at the New Haven, the latter ranged on the lactometer from seventy-four to ninety-four degrees; but the dealers test their milk frequently as they are always on the watch so as to dock the farmers for the milk; the accompanying table of analyses of watered milk shows that the addition is always from three to ten per cent more than the lactometer indicates; the examples are few because an analysis is not generally made, as the lactometer is positive evidence of adulteration by water if nothing else is added or if the cream has not been removed.

TABLE No. 11.

Analyses of Watered Milk.

Number.	NAME OF SELLER.	Temperature, degrees.	Lactometer.	Lactometer at sixty deg. Far.	Water.	Fat.	Caseine and sugar.	Salts.	Added water by lactometer.	Added water by analyses.
1	F. Zufinger	60	62	62	92.10	2.55	5.03	.32	38	407
2	F. Zufinger	60	66	66	92.97	1.61	5.10	.32	34	39.8
3	C. Z. Binden	61	71	71	91.74	2.29	5.54	.43	29	33.7
4	H. Halfemeister	49	76	72	92.78	1.16	6.06	Included with caseine	28	32.6
5	E. Stetter	56	82	80	91.31	1.31	6.76	Included with caseine	20	24.8
6	J. E. Hegemann	60	80	80	90.92	2.28	6.28	.52	20	24.4
7	F. Zufinger	61	81	81	90.99	2.24	6.23	.54	19	24.8
8	H. Boyers	61	82	82	90.61	2.61	6.35	.43	18	24.7
9	H. Boyers	60½	82	82	90.25	2.80	6.53	.42	18	22.8
10	F. Peters	39	90	84	91.18	1.83	6.99	Included with caseine	16	28.3
11	F. Barenborg	40	92	86	89.48	3.32	7.20	Included with caseine	14	20.0
12	H. F. Horton	59	88	88	90.94	1.84	7.22	Included with caseine	12	19.6
13	S. Schroder	53	90	88	90.56	2.15	7.29	Included with caseine	12	19.0
14	C. Meyer	48	93	89	88.79	3.75	7.45	Included with caseine	11	17.2
15	H. Frey	50	94	90	90.38	2.22	7.40	Included with caseine	10	17.7
16	W. Kuhlmann	44	94	90	89.74	2.73	7.53	Included with caseine	10	16.3
17	H. Meyer	44	94	90	89.52	3.00	7.48	Included with caseine	10	17.2
18	G. Ihnken	60	90	90	89.37	2.74	7.29	.60	10	12.4
19	H. Fletcher	53	94	91	89.96	2.57	7.47	Included with caseine	9	17.0
20	A. H. Menken	48	96	91	89.87	2.66	7.47	Included with caseine	9	17.0
21	D. Lynch	57	92	91	89.78	2.78	7.44	Included with caseine	9	17.3
22	O. Helmken	43	98	92	89.64	3.02	7.34	Included with caseine	8	18.4
23	L. Rabuteau	60	92	92	89.20	2.98	7.82	Included with caseine	8	13.(

24	F. W. Meyer	60	93	93	90.16	2.37	7.47	Included with caseine	7	17.0
25	H. Fajen	60	94	94	89.22	3.20	7.01	.54	6	15.8
26	H. C. Heldmann	53	98	94	89.15	3.10	7.75	Included with caseine	6	14.0
27	J. H. Muenler	42	100	94	89.18	3.00	7.82	Included with caseine	6	13.0
28	J. Schuback	60	94	94	88.32	3.90	7.78	Included with caseine	6	13.4
29	H. Clans	63	94	95	89.22	2.83	7.95	Included with caseine	5	11.5
30	A. Bollenbacher	51	98	95	88.35	3.53	8.12	Included with caseine	5	9.8
31	J. G. Rolfes	44	101	96	89.80	2.41	7.79	Included with caseine	4	13.4
32	J. O. Gibney	60	96	96	89.01	2.96	7.49	.55	4	10.7
33	Mehlmann Bros	53	98	96	88.78	3.38	7.84	Included with caseine	4	12.8
34	J. J. McCabe	60	96	96	88.51	3.66	7.83	Included with caseine	4	12.7
35	Orange County Milk Association	59	97	97	89.65	2.49	7.25	.61	3	12.7
36	W. Lynch	60	97	97	89.09	3.19	7.04	.68	3	14.2
37	J. Miller	59	97	97	88.73	3.06	8.21	Included with caseine	3	8.8
38	H. Steffins	55	100	98	89.21	2.25	8.54	Included with caseine	2	5.1
39	Lake Milk Company	60	100	100	88.65	3.02	8.33	Included with caseine	....	7.5
40	A. H. Robbins	60	100	100	88.60	3.11	7.68	.61	....	7.9
	Salted and Watered Milk.									
41	C. Morlach	67	108	110	89.56	1.61	7.82	1.01	.29	13
42	J. Dolgner	60	99	99	89.06	2.95	6.80	1.19	.42	20

These (41 and 42) were found, and analyses made by Dr. J. B. White.

The adulterations that are practiced upon milk are the additions of water, and with it occasionally salt, borax, or soda, under the plea of preservation, but really to increase the specific gravity so that the adulteration cannot be so easily discovered with the lactometer, and the removal of cream either entirely or partially, and the dual adulteration of watering skimmed milk, so that the increased specific gravity by skimming will not be apparent.

Borax and Water added.

There is not much adulteration by the addition of borax or boracic acid on account of the expense, the difficulty of solution, and the low specific gravity of a saturated solution (1.045). An analysis of a sample so adulterated :

Lactometer at 60 degrees F	108
Water	87.43 per cent.
Fat	3.60 per cent.
Caseine and sugar	8.30 per cent.
Salts	.67 per cent.

The borax was determined qualitatively in the ash ; the milk originally was of excellent quality, so the amount of water added with the borax is not so apparent.

As a preservative the use of borax and boracic acid is a total failure; they keep the curd from precipitating, but do not prevent the milk from decomposing, as after a few days standing at a temperature below 60 degrees F., the above sample emitted a very putrid, disgusting odor.

Soda.

Soda was formerly added to raise the specific gravity and keep the milk from souring, and in large enough quantities to make the ash fuse on igniting, but no samples containing it have been obtained lately.

Chalk, etc.

Chalk, starch, etc., are impracticable as they settle on standing.

Of the two hundred cows, in a healthy, normal condition, seen milked, during the compilation of this report, no sample of the entire yield at a milking from each of these cows, when cooled to 60 degrees F, and thoroughly mixed, has had a specific gravity below 1.0293 or 101 degrees on the lactometer, and of nearly 1,000 samples of pure milk tested by the inspectors of the New York City Health Department, under the same conditions as above, but two have stood below 1.029 or 100 degrees, and these were taken from sickly cows during the very hot summer of 1876.

The Lactometer.

1. The lactometer is a hydrometer which indicates specific gravities between 1.000, the gravity of water, and 1.0348.

2. It is used to determine the specific gravity of the milk.

3. As the specific gravity varies with the temperature, the observations are made at a standard temperature of 60 degrees F.

4. The specific gravity of the average milk at a milking of a healthy cow, properly fed and in a normal condition, varies from 1.092 to 1.0348. The former number being the lowest or minimum gravity, 100 degrees is placed at this point on the lactometer; O degree is placed at 1.000, the gravity of water; the intervening space is divided into 100 degrees, and the graduations are continued to 120 degrees, which corresponds to the specific gravity 1.0348.

5. To apply the lactometer, the temperature of the milk is first noted with the aid of the thermometer; the lactometer is then carefully inserted, taking pains to avoid wetting the portion of the stem above the milk, and to free the surface of the milk from foam. The degree to which the instrument sinks is then noted. Bearing in mind the effect of temperature on the gravity, the inspector now decides whether the gravity will probably be below 100 degrees at sixty degrees F. If he thinks it will, he carefully cools or warms a sample of the milk, as the case may require, to sixty degrees F., and again inserts the lactometer. If it stands below 100 degrees, the gravity is below that of any genuine milk. He carefully notices the consistence to determine whether he has before him a sample of thin watered milk or a sample of thick cream. The black background of the shot in the lower bulb enables the inspector, as the milk runs off the lactometer, to judge of its consistence. The color is also noted, as well as the odor and taste. Low specific gravity (below 100 degrees equal 1·029) together with abnormal watery consistence, and a watery taste, establish the fact of adulteration by water, which is the most common form of adulteration, because the simplest and most convenient.

If the specific gravity be above 100 degrees, it does not follow that the milk is pure and unadulterated. Skimming, by removing the lighter cream, increases the gravity of the milk; so skimmed milk is heavy; but it appears at the same time very thin, and the inspector's attention will be at once arrested by the inconsistency of high gravity and a watery character. In this, as in other cases where the inspector suspects adulteration of any kind which cannot be proved by the above-mentioned tests of gravity, consistence and taste, he is instructed to take a sample for further examination by the cream test, chemical analysis, and the microscope.

Value of Lactometer degrees in specific gravity.

Lactometer.	Gravity.	Lactometer.	Gravity.
0	1·00000	10	1·00290
1	1·00029	11	1·00319
2	1·00058	12	1·00348
3	1·00087	13	1·00377
4	1·00116	14	1·00406
5	1·00145	15	1·00435
6	1·00174	16	1·00464
7	1·00203	17	1·00493
8	1·00232	18	1 00522
9	1·00261	19	1·00551

Lactometer.	Gravity.	Lactometer.	Gravity.
20	1·00580	71	1·02059
21	1·00609	72	1·02088
22	1·00638	73	1·02117
23	1·00667	74	1·02146
24	1·00696	75	1·02175
25	1·00725	76	1·02204
26	1·00754	77	1·02233
27	1·00783	78	1·02262
28	1·00812	79	1·02291
29	1·00841	80	1·02320
30	1·00870	81	1·02349
31	1·00899	82	1·02378
32	1·00928	83	1·02407
33	1·00957	84	1·02436
34	1·00986	85	1·02465
35	1·01015	86	1·02494
36	1·01044	87	1·02523
37	1·01073	88	1·02552
38	1·01102	89	1·02581
39	1·01131	90	1·02619
40	1·01160	91	1·02639
41	1·01189	92	1·02668
42	1·01218	93	1·02697
43	1·01247	94	1·02726
44	1·01276	95	1·02755
45	1·01305	96	1·02784
46	1·01334	97	1·02813
47	1·01363	98	1·02842
48	1·01392	99	1·02871
49	1·01421	100	1·02900
50	1·01450	101	1·02929
51	1·01479	102	1·02958
52	1·01508	103	1·02987
53	1·01537	104	1·03016
54	1·01566	105	1·03045
55	1·01595	106	1·03074
56	1·01624	107	1·03103
57	1·01653	108	1·03132
58	1·01682	109	1·03161
59	1·01711	110	1·03190
60	1·01740	111	1·03219
61	1·01769	112	1·03248
62	1·01798	113	1·03277
63	1·01827	114	1·03306
64	1·01856	115	1·03335
65	1·01885	116	1·03364
66	1·01914	117	1·03393
67	1·01943	118	1·03422
68	1·01972	119	1·03451
69	1·02001	120	1·03480
70	1·02030		

In the hands of an expert, or a person who takes all the precautions noted above, the lactometer is an absolute instrument for the detection of adulteration by water alone, but the reading is nearly always three to ten or more per cent below the actual amount of added water, and in the case of skimmed milk, ten to twenty per cent of water can be added and the lactometer still float above 100 degrees.

Removal of Cream.

The form of adulteration, which is committed to the greatest extent, is the removal of cream, either wholly and using the skimmed milk as an adulterant for other milk or partially, and selling the product as pure milk; as this removal of cream or skimming can be done more closely and cheaply by commencing before the milk is cooled to take out the animal heat and allowing the cream to raise thoroughly during the refrigeration, the operation is generally carried on in a large way in creameries, which are establishments at which the milk is received from the neighboring farmers, cooled by placing the cans or coolers in tanks through which flows spring or iced water, and then when the cream has risen for ten or twelve hours, skimmed, usually by means of conical pint dippers, either by taking one pint of cream, or about one-fourth of the entire quantity from each fifteen quart cooler and bringing the product, which is called No. 1, below the standard of very poor milk (according to the quality of the original milk this residue contains from 2.5 to 3.5 per cent of fat); or else another dipperful is removed so that the remainder contains about half (1.5 to 2.5 per cent of fat), the original complement of cream, and is sold as No. 2 or half and half, as milk of the same quality is made by mixing equal parts of good milk and straight skimmed milk; another dipperful is removed and the product is known as No. 3 (0.8 to 1.5 per cent of fat) which is the poorest form that can be palmed off on discriminating consumers, and is that which is sold in cheap restaurants by the bowl; or two more dipperfuls of cream are removed (two and one-half to three and one-half pints in all) and the residue, with less than half of one per cent of fat, is used to adulterate other milk, or else is sold to the poor who cannot, or will not try to obtain any thing better, this is known as No. 4, straight skim, or Methodist (on account of the large quantities of it used at camp meetings); a few creameries make their skimmed milk into pot cheese or skim cheese, but these are exceptions; this practice of skimming is carried on so extensively that for a long period of the summer of 1881, 2,000 cans or 80,000 quarts of more or less skimmed milk were shipped to Jersey City nightly, and cream was produced so cheaply that it sold for from fifteen to twenty, average seventeen cents per quart, from one quart of which two quarts of ice cream are made. As before intimated this skimming is generally done on a large scale, so that the removal of one-fourth of the cream amounts to considerable, and the profit is so large that the creameries pay the farmers for their milk the same as, or one-fourth of one cent per quart below the market price; and keep that price down to two cents per quart by flooding the market with skimmed milk, so that the farmer has no inducement to improve his stock, or feed them better, as he cannot obtain any more for the best milk than the creameries do for skimmed milk, as the price is con-

trolled by these creameries, and regulated by a price committee of New York and vicinity milk dealers, who are their instruments; these are known as the New York Milk Exchange (Limited).

Creamery is another name for wholesale fraud. The following is a list of seventy-three creameries sending skimmed milk to New York city and vicinity; those in New York State were nearly all inspected, or the milk from them examined during the summer of 1881, and analyses of samples of milk manufactured by them have been made, the results of which are given further on in this report; this list has been arranged in the order of the stations on the railroads transporting product of these creameries to New York. The list of New Jersey creameries sending skimmed milk to New York was prepared by Dr. William K. Newton, of Paterson, State Milk Inspector of New Jersey.

CREAMERIES SENDING SKIMMED MILK TO NEW YORK CITY, NEW YORK STATE.

New York, Lake Erie and Western Railroad.

Monticello	P. A. Van Sickle.
Turner's	Farmers' Creamery Association.
Monroe	Monroe Dairy Association.
Monroe	New York Dairy Company.
Monroe	N. D. Woodhull & Co.
Oxford	Samuel Marwin.
Chester	W. A. Lawrence.
Goshen	Carpenter Howell.
Hampton	A. V. Ryerson.
Middletown	Orange County Milk Association.
Howell's	A. T. Berthoff.
Otisville	Wheat and Savage.
Port Jervis	Abram Swartwout.
Washingtonville	Farmers' Creamery Association.
Washingtonville	J. B. Harlow.
Kipps'	T. J. Tuthill.
Campbell Hall	Campbell Hall Milk Company.
Campbell Hall	David H. Thompson.
Campbell Hall	C. Green.
Campbell Hall	W. H. Pierson & Co
Campbell Hall	A. Tower.
Campbell Hall	T. A. Mills.
Montgomery	C. H. C. Beakes & Co.
Florida	Stewart Young.
Florida	Mt. Eva Creamery (J. T. Armstrong & Co.).
Pine Island	Brown & Bailey.
Pine Island	Amity Milk Association.
Sugar Loaf	R. Milburn & Co.
Sugar Loaf	Lake Milk Company.
Lake	Lake Milk Company.
Lake	Bates & Co.

Durland's	Lake Milk Company.
Warwick	Warwick Valley Milk Association.
Warwick	A. Henion & Co.
Warwick	Bates & Co.
Warwick	Thomas O. Smith.
Warwick	W. P. Uptegrove.
Sanford's	Pierson E. Sanford & Co.
Rutherford	W. P. Uptegrove.
South Gilboa	C. H. Mayham.
Roxbury	Jefferson Post.
Stamford	Stewart Young.

New York, Ontario and Western Railroad.

Hurleyville	Jordan Brothers.

Middletown and Crawford Railroad.

Pine Bush	D. W. Berry.
Pine Bush	J. A. Beakes.
Pine Bush	Alonzo Beakes.
Bullville	S. D. Roberson.
Bullville	D. W. Berry.
Searsville	H. & W. Comfort.
Circleville	D. W. Berry.
Circleville	Circleville Milk Association.

New York, Susquehanna and Western Railroad.

Unionville	M. S. Hayne.
Slate Hill	Squire Hill Creamery.

New York and Harlem Railroad.

Pawlings	John B. Dutcher.

Steamer "William Tittermer."

Temple Hill	E. D. Pierson.

New York, New Haven and Hartford Railroad.

Sheffield, Mass	David S. Draper.

List of creameries in New Jersey that ship milk or cream to New York city, prepared by W. K. Newton, M. D., State Milk Inspector of New Jersey.

Brice W. Walling	Deckertown.
Brice W. Walling	Hamburgh.
Brice W. Walling	Quarryville.
Brice W. Walling	Monroe Corners.
George O. Onsted	Andover.
Frank D. Jackson.....	Andover.
S. S. Beach & Sons	Newton.
M. S. Hayne	Unionville, N. Y.; Clove Valley, N. J.
John Decker & Co.....	Ogdensburg.
Brown & Bailey.....	Glenwood.
William P. Uptegrove...	Vernon.
John Bates.....	Morris Plains.
Thomas O. Smith.....	Morristown.
John T. Leigh.....	Clinton.
John McLaughlin.....	Annandale.
Luther Hoffman.....	Lebanon.
Wilson & Clark.....	Lebanon.

For the detection of the amount of cream that has been removed, the cream gauge is the simplest instrument but it is not reliable, as when the cream has once risen and then is mixed again with the milk, there is no certainty of the proportion which will rise again; the addition of water tends to force up the cream; the amount that rises in the creamometer is also affected by the time, the temperature and the condition of the milk with regard to approaching acidity. Still if the gauge shows over ten per cent of cream, probably none has been removed.

As with the lactometer, so with analysis, it is necessary to establish a standard. Massachusetts and New Jersey have established by law a chemical standard of purity, namely: Less than 87 per cent of watery fluids, or more than 13 per cent of milk solids. Wanklyn recommends a minimum standard of 87.5 per cent of water, 3.2 per cent of fat, and 9.3 per cent of solids not fat; and the British Society of Public Analysts fixes on maximum water at 88.5 per cent, and minimum butter as 2.5 per cent, and solids not fat as 9 per cent.

The last of these is entirely too low, as it allows the removal of more than one-third of the cream from average milk, as well as the use of refuse or putrid feed for the cows, as nothing besides distillery swill has been found to produce milk below that standard; the second is lower than any pure milk that has been found from healthy dry or grass fed cows, with rare exceptions; while the first is higher than numerous instances of pure milk, as in the present condition of the business of producing milk for market, there are no inducements for increasing the quality, quantity being the consideration, as the price is rarely controlled by the quality.

Still, it is better to have too high than too low a standard, as there must be some margin allowed below the standard for errors of analysis,

and it is well to conform with the standards adopted by other States to insure uniformity; also, to prevent, as has been the case with testing with the lactometer, small adulterations, so as to reduce the better qualities of milk to the poorest that will pass inspection.

By the New Jersey Milk Law of 1882, the standard adopted requires at least twelve per cent of milk solids.

TABLE No. 13.

Skimmed Milk.

Number.	NAME OF LOCATION OF CREAMERY.	Consignee.	Temperature, degrees.	Lactometer.	ANALYSES.				Caseine, sugar and salts.
					Water.	Fat	Caseine & sugar.	Salts.	
1..	New York Dairy Co., Monroe	I. W. Meyer, 2½ Albany street	61	117	89.86	.71	8 74	.69	
2..	Samuel Marwin, Oxford	Christopher Schultz, 119 Mott street	60½	116	88.60	2.03	†9.37	....	
3..	Samuel Marwin, Oxford	Adolph Zeidler, 26 Scammel	60½	115	88.47	3.05	9.48	....	
4..	Carpenter Howell, Goshen*	Casper Whim, 108 Delancey	61½	101	90.66	1.30	7.43	.63	
5..	Carpenter Howell, Goshen	John Lohman, 349 Cherry street	60	108	89.59	1.71	7.99	.71	
6	Carpenter Howell, Goshen	Hermann Behling, 522 East 11th street	60	105	89.48	1.97	7.96	.59	
7.	Carpenter Howell, Goshen	Frederick Setular, 54 West 13th street	60	113	88.70	2.10	8.46	.71	
8..	Farmers' Creamery Ass'n, Washingtonville*	Farmers' Creamery Ass'n, 167 Seventh avenue	60	98	89.71	1.82	7.81	.66	
9..	Farmers' Creamery Ass'n, Washingtonville*	Farmers' Creamery Ass'n, 167 Seventh avenue	60	100	89.20	2.22	7.92	.66	
10..	Farmers' Creamery Ass'n, Washingtonville	Farmers' Creamery Ass'n, 167 Seventh avenue	60	110	88.00	2.88	8.47	.65	
11..	Farmers' Creamery Ass'n, Washingtonville	Farmers' Creamery Ass'n, 167 Seventh avenue	60	113	87.66	2.84	8.66	.64	
12..	J. B. Harlow, Washingtonville*	John Snell, Jersey City	60½	104	90.54	1 03	7.81	.62	
13..	J. B. Harlow, Washingtonville	C. Simis	60	111	88.62	2.29	8 44	.65	
14..	J B. Harlow, Washingtonville	J. King, 252 West Houston street	60	105	88.63	2.46	8.38	.63	
15..	E. D. Pierson, Temple Hill	Henry Miller, 269 Spring	60½	116	88.97	1.64	8.69	.70	
16.	David H. Thompson, Campbell Hall	James Cusick, 44 Market street	60	117	90.55	.06	8.70	.69	
17..	David H. Thompson, Campbell Hall	Otto Semm, 83 Thomas street	60	108	88 43	2.60	8.25	.72	
18..	C. Green, Campbell Hall	J. D. Steffens, 465 Greenwich street	62	115	87.90	2.61	8.76	.73	
19..	Campbell Hall Milk Co., Campbell Hall	William C. A. Witt, 369 10th avenue	60	109	89.86	1.42	8.03	.69	
20 .	Campbell Hall Milk Co., Campbell Hall	William C. A. Witt, 369 10th avenue	60	114	87.55	3.11	8.61	.73	
21 .	Campbell Hall Milk Co., Campbell Hall	John Oldenbuttel, 53 Oliver street	60	109	88.13	2.76	8.40	.71	
22..	W. H. Pierson & Co., Campbell Hall	C. E. Fasnan, Brooklyn	60	114	90.48	.55	8.30	.67	
23..	W. H. Pierson & Co., Campbell Hall	John Van Winkle, 429 West 30th street	60	113	88.55	2.17	8.57	.71	
24..	W. H. Pierson & Co., Campbell Hall	John Van Winkle, 429 West 30th street	60	112	88 27	2 54	8 46	.73	
25..	C H. C. Beakes, Montgomery*	John P. Wierk, 191 Eagle street, Brooklyn	60	105	90.14	1.32	7.89	.65	
26..	C. H. C. Beakes, Montgomery*	John P. Wierk, 191 Eagle street, Brooklyn	61	103	90.26	1.42	7.71	.61	
27..	C. H. C. Beakes, Montgomery	G. Waldeck, 230 Rivington street	60	112	89.47	1.68	8.16	.69	
28..	Stewart Young, Florida	George Miller, 16 Washington street	60	111	89.14	1.37	†8	†.49	
29..	Stewart Young, Florida	George Miller, 16 Washington street	60	114	88.54	2.35	8.37	.74	
30..	Stewart Young, Florida		60	109	88.00	2.82	8.45	.73	
31..	I. T. Armstrong, Florida	Louis Eckhardt, 188 Spring street	60	114	88.76	2.14	8.47	.63	
32..	Brown & Bailey, Pine Island	S. C. Baldwin, Jersey City	61	116	89.58	1.18	8.52	.72	

33..	Brown & Bailey, Pine Island	S. C Baldwin, Jersey City	61	116	89.21	1.36	8.71	.72	
34..	Brown & Bailey, Pine Island*	G. P. Decker, 76 Kosciusko street, Brooklyn	60½	107	90.01	1 31	8.06	.62	
35..	J. Bates, Lake	Lake Milk Co., 57 Sixth avenue	60½	116	88 18	2.50	8.71	.71	
36..	Lake Milk Co., Lake	Lake Milk Co., 57 Sixth avenue	59	109	88.64	2.61	8.06	.69	
37..	Bates & Co., Warwick	Warwick Valley Milk Ass'n, 1279 Broadway	61	116	90.70	.08	8 50	.72	
38.	Bates & Co., Warwick	Warwick Valley Milk Ass'n, 1279 Broadway	60	112	91.25	.11	7.92	.72	
39..	A. Henion & Co., Warwick	Pierson E. Sandford & Co., 1252 Broadway	60	113	88 82	1.75	8.74	.69	
40..	W. P. Uptegrove, Warwick	John Brumkhorst, 61 Delancy street	60	110	87.56	3.03	†9 41	....	
41..	W. P. Uptegrove, Rutherford	Louis Snell, Jersey City	61	116	90.85	.26	8.14	.74	
42..	C. H. Mayhans, South Gilboa	W R. Herschmann, 54 Avenue C	60	111	88.46	2 17	†9	†.37	
43..	Jefferson Post, Roxbury	William Young, 101 Washington street	60	114	89.49	1 48	8.29	.74	
44..	Jefferson Post, Roxbury	William Young, 101 Washington street	60	106	89.30	1.96	8.05	.69	
45..	Jefferson Post, Roxbury	William Young, 101 Washington street	58	112	87.72	2.96	†9	† 32	
46..	Circleville Milk Ass'n, Circleville	M. F. Dalton, 374 Hicks street, Brooklyn	60	112	89.52	1.56	†8	†.92	
47..	Circleville Milk Ass'n, Circleville	Pierson E. Sandford, 1252 Broadway	60	108	87 60	3.11	8.61	.68	
48..	J. A. Beakes, Pine Bush	John H. Holling, 640 W. 46th street	60½	107	89 16	2.22	7.93	.69	
49..	D. W. Berry, Pine Bush	P. N. Helanck, cor. S. 1st and 11th st., Brooklyn	60	113	88.24	2.60	†9	† 16	
50..	Squire Hill Creamery, Slate Hill	G. Wendeburg, 634 Kosciusko street, Brooklyn	60	113	88.25	2.41	†9	†.34	
51..	M. S. Hayne, Unionville	William Muller, 95 West Houston street	60	110	88.19	2 67	8 44	.70	
52..	M. S. Hayne, Unionville	August Ruzer, 426 West 39th street	60	112	87.78	2 93	8.58	.71	
53..	Jordan Brothers, Hurleyville*	Ferdinand Weymann, 93 Willet street	60	109	90.01	1.36	7.98	.65	
54..	John B. Dutcher, Pawlings*	H. B Wright, 891 8th avenue	60½	104	90.29	1.34	7 77	.60	
55.	John B. Dutcher, Pawlings*	H. B. Wright, 891 8th avenue	60	102	90.24	1 53	7 60	.63	
56..	James Ramsey, Lebanon, N. J	Fred. J. Seelig, 72 Canal street	62	114	87 53	2.70	†9	†.77	
57..	T. O. Smith, Morristown, N. J	T. O. Smith, 877 Sixth avenue	61	110	88.06	2.23	9 01	.70	
58..	George O. Ousted, Andover, N. J	George O. Ousted, 631 Washington street	60½	108	89.26	2.03	8.02	.69	
59..	George O. Ousted, Andover, N. J	George O. Ousted, 631 Washington street	60	109	88.86	2.31	†8	†.83	
60..	George O. Ousted, Andover, N. J	George O. Ousted, 631 Washington street	60	109	88.69	2.64	8.00	.68	
	Average of 60 analyses		60	110.45	89.039	1.954	8.271	67	9.224

*Skimmed and watered. † Caseine, sugar and salts.

MARKING SKIMMED MILK.

NEW YORK.

Chapter 220 — *Laws of* 1878.

AN ACT for the protection of dairymen and dealers in milk, and to prevent deception in the sale of milk.

Passed May 7, 1879; three-fifths being present.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

SECTION 1. Every person who shall sell, or who shall offer or expose for sale, any milk from which the cream, or any part thereof has been removed, shall distinctly and durably mark, in letters not less than one inch in length, in a conspicuous place, above the center upon the outside of every can, vessel or package containing such milk, the words "skimmed milk," and such milk shall only be sold in or retailed out of a can, vessel or package so marked.

NEW JERSEY.

Chapter CLXI.

AN ACT to prevent the adulteration of milk and to regulate the sale of milk.

I. Be it enacted by the Senate and General Assembly of the State of New Jersey, That every person who shall sell, or who shall offer or expose for sale, or who shall transport or carry, or who shall have in possession with intent to sell, or offer for sale, any milk from which the cream, or any part thereof has been removed, shall distinctly, durably and permanently solder a label, tag or mark of metal in a conspicuous place upon the outside and not more than six inches from the top of every can, vessel or package containing such milk, and said metal label, tag or mark shall have the words "skimmed milk" stamped, engraved or indented thereon in letters not less than one inch in height, and such milk shall only be sold or shipped in or retailed out of a can, vessel, or package so marked, and every person who shall violate the provisions of this section shall be deemed guilty of a misdemeanor, and on conviction thereof shall be subject to the penalties prescribed in section eight of this act. Approved March 22, 1881.

The New York law with regard to making skimmed milk never has been enforced, because as it was everybody's business to make complaints under that law, nobody did so; the only attempt at marking being with black paint, which was rubbed off by a cloth dipped in kerosene, while crossing the ferry, as in New York city, the inspectors, when skimmed milk was found in cans so marked, that milk was destroyed and the possessor arrested, as the Sanitary code regulation with regard to milk prohibits the sale, or exposure for sale of skimmed milk, marked or not; hence the law has been a dead letter.

During the summer of 1881, the New Jersey law was rigidly en-

forced by the State Milk Inspector (Dr. W. K. Newton), and attempts at evasion were numerous; besides marking with paint as described above, card-board or metallic tags have been found attached to the cans or their covers by means of cord or wire; these methods are not within the letter of the law, although sometimes passed by the inspector as better than none; the regular way of marking is with a tin label, about six inches long and one inch in height, on which are indented the words "skimmed milk" with skeleton letters, this label would not be noticed unless looked for closely; the most successful evasion, as it is entirely within the letter of the law, and still would not attract the attention, is a metallic label soldered on the neck of the can, and marked in skeleton letters thus:

This label is one inch high, less than three inches long, and was made to imitate the can manufacturer's tag.

In no instance have the words been marked on the cans the same as the producer's initials or the number or name of the railroad station, that is, in brass letters of a width in proportion to the height, without which any marking would be entirely useless as a protection to the consumer, and with which would be nearly useless, as the can could be turned so that the marking would not show if sold from a cart, or placed in a refrigerator or dark corner if sold in a store. Some creameries mark all their cans, whether containing pure milk or cream, "skimmed milk," therefore there should be no half-way method by marking, but the sale of skimmed milk should be absolutely prohibited.

There is no question about the injurious effects of skimmed milk on small children on account of the lack of nourishment, or the starvation produced by want of its most nutritious constituent — the fat; as when children are fed on bread and skimmed milk, the amount of fattening material consumed is infinitesimal, and when disease attacks them, they have but little power to resist nor strength to endure the siege; if this question was debatable, the appearance and condition of the children at an orphan asylum in New York city, where they had been fed on skimmed milk for a long time, could be given as positive proof of the semi-starvation produced by its use, and the numerous deaths among them show the results.

Condensed Milk.

Four different companies supply condensed milk from wagons, daily to consumers in New York city.

The American Condensed Milk Company, depot 205 East Twenty-seventh street, whose factories are at Prudy's, Westchester county (production 4,000 pounds daily); and at Hawleyville, Conn. (500 pounds).

New York Condensed Milk Company, "Borden's Condensed Milk,"

"Gail Borden, Eagle Brand," depot, 227–229 East Thirty-fourth street; office, 79 Murray street, whose factories are at Wassaic, Dutchess county (production 14,800 pounds daily); and at Brewsters, Westchester county (2,300 pounds).

Eagle Condensed Milk Company, "Orange County Milk Association;" depot, 27 Vestry street, whose factories are at Middletown, Orange county (production 4,100 pounds daily); and at Fort Plain, Montgomery county (production 800 pounds).

National Condensed Milk Company, S. W. Canfield, president; depot, 121 East Eleventh street; factory at Millbrook, Dutchess county (production 850 pounds daily).

Besides these, there is sold in bottles, Alpine condensed milk, factory at Romanshorn, Switzerland.

With the exception of the American, these were not fluid enough to take the specific gravity; the American has a specific gravity of 1.125 at sixty-two degrees Fah.

The analyses of these condensed milks gave the following results:

CONDENSED MILK.	Water.	Fat.	Sugar.	Caseine.	Salts.
American	50·73	14·19	13·51	18·88	2·69
New York	61·74	11·44	13·90	11·92	2·00
Eagle	61·76	12·02	10·50	13·67	2·15
National	61·07	10·92	12·36	13·12	2·13
Alpine	63·08	9·49	13·25	12·17	2·01

The Alpine is sold in pint bottles with glass stoppers, made tight by means of a rubber ring, and fastened by wire; it is of a dark yellow color, and was well preserved on opening, although it mildewed after being open for five days in a cold room.

The others soured after two days' exposure in a room kept at a temperature below sixty degrees Fahr.

Preserved Milk.

Preserved milk is condensed milk, to which about forty per cent of cane sugar is added during the process of condensation. It is usually sold in tin boxes, holding one pound each.

The seven from the top of the list are those generally sold in groceries, the others are occasionally found, but do not seem to be in great demand, and therefore analyses have not been made of them; some of them are not made now.

	Factory at.
1. Anglo-Swiss (Switzerland)	Chan, Switzerland.
2. Anglo-Swiss (England)	England.
3. Diamond (National Condensed Milk Co.)	Millbrook, Dutchess Co.
4. Eagle (Gail Borden, New York Condensed Milk Co.)	Walden, Orange Co.
5. Crown (Gail Borden, New York Condensed Milk Co.)	Walden, Orange Co.
6. Pearl (Orange County Milk Association)	Middletown, Orange Co.
7. Alderney (American Condensed Milk Co)	Prudy's, Westchester Co.

	NAME OF BRAND.	Water.	Fat.	Milk and cane sugar.	Caseine.	Salts.
1.	Anglo-Swiss	25·40	7·47	54·46	10·65	2.02
2.	Anglo-Swiss	27·73	7·87	52·92	9·33	2·15
3.	Diamond	26·81	9·22	49·16	12·69	2·12
4.	Eagle	30·21	7·51	50·15	10·29	1·84
5.	Crown	29·12	9·07	49·61	10·21	1·99
6.	Pearl	28·79	11·54	45·64	11·79	2·24
7.	Alderney	31·30	10·51	45·39	10·88	1·92

Preserved Milks occasionally sold.

		Factory at.
8.	Cream-milk	Shadlow, England.
9.	Swiss Condensed Milk, dairy brand.....	Thun, Switzerland.
10.	Swiss Condensed Milk, Alpina brand	Luxburg, Switzerland.
11.	Italian (Bohringerallina & Co.)	Milan, Italy.
12.	Crescent (F. H. Leggett & Co.)..... ...	St. Johnsville, N. Y.
13.	American-Swiss (N. Gerber).....	Little Falls, N. Y.
14.	New York State (Eagle Condensed Milk Co.)	Fort Plain, N. Y.
15.	Crescent (Eagle Condensed Milk Co.)	Middletown, N. Y.
16.	Eureka (National Condensed Milk Co.)...	Millbrook, N. Y.
17.	Osprey (Canfield's Preserved Milk).....	York, Penn.
18.	Monumental (Baltimore Condensed Milk Co.).....	York, Penn.

Respectfully submitted,

CHARLES E. MUNSELL.

REPORT

OF THE

EXAMINATION OF TWENTY-FIVE SAMPLES OF KEROSENE OIL, COLLECTED IN COXSACKIE, CASTLETON, HUDSON AND SCHENECTADY, BY WILLIS G. TUCKER, ANALYST.

[Assem. Doc. No. 89.] 40

REPORT.

Dr. ELISHA HARRIS, *Secretary, etc., Albany :*

SIR — In accordance with your instructions conveyed in your letter of the 15th ultimo in which you state that "this board has information" that "in the river districts of Albany, in the village of Castleton and the city of Schenectady" kerosene is "now being sold at prices and under spurious names and recommendations that warrant suspicion of the stuff being dangerously below legal standard," I caused to be collected by an assistant, Mr. A. G. Losee, various samples of kerosene oil (twenty-five in all in number) in the aforesaid districts as follows : In Coxsackie, four (4) samples; in Castleton, four (4) samples; in Hudson, ten (10) samples, and in Schenectady, seven (7) samples. The collector was instructed to keep a careful watch for "burning fluids" advertised or sold under peculiar names or unusual circumstances and to obtain samples of such fluids "if found on sale, and with regard to the purchasing of samples of ordinary kerosene to obtain the same both from the better and the poorer class of stores, the object being to determine whether any peculiar brand of unsafe oil was being extensively retailed in these places and also to ascertain what grade of kerosene oil was most largely sold and generally employed in the localities named. Of course without an exhaustive canvass we could not expect to obtain samples of all the oils sold in these places, and as this was not deemed necessary we endeavored only to obtain a fair number of representative samples.

Accompanying this report will be found the separate report and the test of each of the twenty-five (25) samples collected. No "safety oils," "patent burning-fluids," or other peculiar brands of oil were encountered, though a careful watch was kept for such. Neither, it will be observed, were any kerosenes of low grade or much below the legal standard, discovered on sale; of the twenty-five samples collected and tested but two (2) fell below one hundred degrees (100°). The following table exhibits the results obtained, which must be considered very satisfactory :

Number.	Record number.	WHERE PURCHASED.	97 degrees.	98 degrees.	99 degrees.	100 degrees	102 degrees.	104 degrees.
			Deg.	Deg	Deg.	Deg.	Deg	Deg.
1	8603	Coxsackie....	....	.....	.....	.....	102	.....
2	8604	Coxsackie....	.....	.....	.....	.....	102	.....
3	8605	Coxsackie....	.....	.....	.....	.....	102	.....
4	8606	Coxsackie....	.....	.....	.....	.....	102	.....
5	8607	Castleton	.....	.....	.....	....	102	.....
6	8608	Castleton.....	....	.....	.....	100	.....	.....
7	8609	Castleton.....	.....	.....	....	.....	.....	104
8	8610	Castleton.....	.....	.....	.....	100	.....	.....
9	8611	Schenectady..	.....	.....	.....	.....	102	.....
10	8612	Schenectady..	.....	.....	.....	.....	102	.....
11	8613	Schenectady..	.....	.....	.....	100	.....	.....
12	8614	Schenectady..	.....	.....	.....	.....	102	.....
13	8615	Schenectady..	.....	....	.....	.....	102	.....
14	8616	Schenectady..	.....	.....	.....	100	.....	.....
15	8617	Schenectady..	.....	.....	.....	100	.....	.....
16	8620	Hudson.....	97	.....	.....	.....	.....	.....
17	8621	Hudson.....	.....	.....	.....	.....	102	.....
18	8622	Hudson.....	.....	.....	.....	100	.....	.....
19	8623	Hudson.....	.....	.....	.....	.....	102	.....
20	8624	Hudson.....	.....	.....	.....	100	.....	.....
21	8625	Hudson.....	.....	.....	99	.....	....	.....
22	8626	Hudson.....	.....	.....	.....	100	....	.....
23	8627	Hudson.....	.....	.....	.....	.....	102	.....
24	8628	Hudson.....	.....	.....	.....	100	.....	.....
25	8629	Hudson.....	.....	.....	.....	100	.....	.....

Therefore there flashed at temperatures below the legal standard, two (2) samples, and at or above the standard twenty-three (23) samples, viz.: At 97°, one; at 99°, one; at 100°, ten; at 102°, twelve, and at 104°, one.

From these results it is evident that low grade oils are not commonly sold in the localities visited, and these results accord with those obtained last fall, winter and spring in the examination of kerosene simply collected in Albany, Troy, West Troy, Waterford, Cohoes and neighboring places. They also agree with the statements of dealers and others conversant with the oil trade in this vicinity, which are to the effect that this section of the State is most largely supplied with oil refined by a single large company doing an extensive business, and that this company are, through their agents — in this immediate section of the State at least — supplying a well-refined oil, of good burning quality, and with a flashing point up to the legal requirement.

Doubtless considerable kerosene *is* sold in the same territory which is not up to the test, and a limited number of some such oils were found last spring (were fortunately in the city of Troy), but when the

number of samples which have been tested during the past year is taken into consideration, it seems safe to assert that during that time, and at the present time, this immediate section of the State has been and still is supplied, in the main, with a good quality of oil.

It is certainly greatly to be desired that this state of things may be continued. To this end these dealers who demand from the refiners and thus obtain and sell oil of legal standard would seem to be reasonably entitled to the protection they seek from illegal competition on the part of unscrupulous dealers who purchase and sell at a lower price an inferior quality of oil. This protection could easily be afforded to them had the Board the power to condemn and seize illegal oil. Since the Board has not this power, however, and the law can only be enforced by the institution of legal proceedings against the offenders, and since such proceedings and causations if obtained, might, in the case of petty retail dealers, be oppressive, it would seem that the avenues through which oil enters the State, and is distributed to the large dealers should be carefully guarded, and action taken against the refiners or wholesalers of illegal oil. This would necessitate the employment of traveling inspectors, at present impracticable, but would seem the surest, most economical, expeditious and efficacious method of dealing with the subject, at such time as the services of such inspectors could be called into requisition, or the Board is endowed with more summary powers by the Legislature.

I am, sir, yours very respectfully,

WILLIS G. TUCKER,

Analyst.

LABORATORY, ALBANY MEDICAL COLLEGE, ALBANY, N. Y., *Nov.* 13, 1883.

Flashing Point of 25 *samples of Oil purchased in Albany and examined by Prof. Willis G. Tucker in November*, 1883.

1 sample	flashed at	99 deg. Fahr.
1 sample	flashed at	97 deg. Fahr.
10 samples	flashed at	100 deg. Fahr.
12 samples	flashed at	102 deg. Fahr.
1 sample	flashed at	104 deg. Fahr.
25		

Flashing point of 41 *samples of Oil purchased in Rochester and examined by Prof. S. A. Lattimore.*

1 sample	flashed at	87 deg. Fahr.
1 sample	flashed at	90 deg. Fahr.
1 sample	flashed at	93 deg. Fahr.
1 sample	flashed at	95 deg. Fahr.
1 sample	flashed at	99 deg. Fahr.
2 samples	flashed at	100 deg. Fahr.
10 samples	flashed at	102 deg. Fahr.
3 samples	flashed at	103 deg. Fahr.
8 samples	flashed at	104 deg. Fahr.
1 sample	flashed at	105 deg. Fahr.
1 sample	flashed at	108 deg. Fahr.
1 sample	flashed at	118 deg. Fahr.

REPORT

ON

COMPLAINT AGAINST

THE

GLEN COVE MANUFACTURING COMPANY.

AFFIDAVITS.

In Behalf of Complainants.

To his Excellency, Honorable Grover Cleveland, *Governor of the State of New York, etc., etc.:*

May it please your Excellency — The petition of the undersigned, residents and property owners of Sea Cliff, Glen Cove and the surrounding neighborhood, in the county of Queens, in the State of New York, respectfully shows: That a very large starch and glucose manufactory is and for several years past has been located and carried on at Glen Cove aforesaid by a company known as the "Duryea Glen Cove Starch Manufacturing Company;" that vast quantities of spent acid and offensive refuse material are continually being produced in the operations of said manufactory, and are poured out into the waters of Hempstead bay, on the shores of which Sea Cliff and Glen Cove are situated; that said acid and refuse material pollute the waters of the bay to such an extent as to be detrimental to the oyster and fishing interests, and frequently render the water on the Sea Cliff shore absolutely unfit for bathing purposes; that the foul stench emitted from said acid and refuse material, and the gases emanating from the same source, so thoroughly permeate the atmosphere as, at times, to render respiration oppressive, produce nausea and cause great physical hurt and inconvenience; that the exhalations, traceable to the operation of the factory aforesaid, are exceedingly annoying and offensive, and seriously interfere with the enjoyment of life and property; that they are highly prejudicial to the sick and destructive of the comfort of those in health, and they have become an intolerable nuisance to the residents and property holders of the aforesaid localities; that the local board of health, although heretofore appealed to by prominent citizens for an abatement of said nuisance, has failed to render your petitioners any relief.

Wherefore, your petitioners humbly pray, that your Excellency may be pleased, forthwith, to require the State Board of Health to examine into said nuisance, and to report the results of said examination to your Excellency with all possible speed, and that said nuisance and the persons having control thereof may be dealt with in accordance with the provisions of the statute for such cases made and provided.

And your petitioners will ever pray.

Dated Sea Cliff, *September* 4, 1883.

225 signatures.

In the matter of the application of Hon. John G. Boyd and others, to the Governor of the State of New York, for the action of the State Board of Health, for the suppression of the nuisance arising from the Glen Cove Starch Works, in the town of Oyster Bay.

STATE OF NEW YORK, }
County of Queens. }

Abraham W. Lozier, M. D., residing in the city, county and State of New York, being duly sworn, doth depose and state, as follows :

I have resided for the last four summer seasons at Sea Cliff, Long Island ; I am by occupation a physician, and I have, during the period of such residence, been familiar with the general character and effect of the refuse matter and gaseous exhalations originating with the factory for the making of starch and glucose, situated in the town of Oyster Bay, upon Hempstead bay, and commonly known as the "Glen Cove Starch Works"; that, during the past summer, the odors arising from said refuse and gases have been more offensive than they were during the previous three summer seasons ; that while during the previous seasons the said odors were at times exceedingly unpleasant, and often lasted a long while, they could be better endured and were not so intense as during the past season ; that because of the otherwise exceptionally healthy character and location of Sea Cliff, its freedom from malaria, mosquitoes and insects, its fine bathing beach and drinking water supply, and its accessibility by railroad and steamboat, I have continued my summer residence there notwithstanding the odors aforesaid ; and that most of the other inhabitants of Sea Cliff perhaps numbering from 1200 to 1500 people have done so for the same reasons ; that I and my family have suffered severely, by reason of aforesaid odors and refuse, from nausea and sense of suffocation ; that Sea Cliff especially suffers more than Glen Cove and the adjacent community from said nuisances, because of being situated on Hempstead bay at the mouth of a large creek running from Glen Cove, which creek brings down at almost every ebb-tide vast quantities of refuse and decaying vegetable matter produced by said factory, and said refuse is thrown upon the shore at Sea Cliff and greatly pollutes the water along the shore ; that the town of Glen Cove is partly protected from said nuisance by a dyke covering many acres erected by said factory, and often the water from said dyke is thrown out upon the Sea Cliff shore, deeply impregnated with such refuse matters ; that very often this is done when the wind is strong from the north-east and bearing upon Sea Cliff and away from Glen Cove ; that I do not wish to reflect upon the motives or hereby charge malicious intention upon the person or persons who may empty this dyke ; but do desire to say and do say, that such action is exceedingly fraught with injury to the town of Sea Cliff, and it is the general opinion of the residents of Sea Cliff that such times and wind are selected as shall be of greatest benefit to Glen Cove, but must inevitably be to the greatest discomfort of our own community ; that I have conversed with persons who have resided from three to four miles from said factory who have frequently, during the past summer, been obliged to close their windows and doors against the odors arising from the said causes ; that I have also conversed with prominent citizens of Glen Cove, who declared their entire willingness to appear and testify against said odors, if they

were duly subpœnaed before a court of law ; but said they did not wish to volunteer evidence against their neighbors or against aforesaid works, because of several reasons ; and that they had indignantly refused to sign a petition circulated by said factory, or its friends, because they could not do so truthfully, notwithstanding one of the persons, so importuned to sign the said petition, was himself a stockholder in said corporation or works ; that I consider aforesaid exhalations and the vast quantities of bacteria and other forms of germ-life engendered by said refuse exceedingly deleterious to health, and have seen said matters to be so in several cases of persons affected thereby.

ABRAHAM W. LOZIER, M. D.

Sworn before me, this 9th day of October, 1883.

L. SAMUELS,
Notary Public, No. 152, County of New York.

In the matter of the application of John Foord, Esq., and others, to the Governor of the State.

STATE OF NEW YORK, *County of Queens.*

Harding S. Horton of 345 West Fourteenth street, New York city, being duly sworn, doth depose and state as follows :

I have resided at Mott's Dock, opposite to Glen Cove, during the summer seasons of 1882 and 1883, and I have, during the period of such residence, been familiar with the general character and effect of the refuse matter and gaseous exhalations originating with the factory for the making of starch and glucose, situated in the town of Oyster Bay, upon Hempstead bay, and commonly known as the Glen Cove Starch Works ; that said odors have often been exceedingly offensive night and day, and lasted for many hours, and were the source of great discomfort to myself and others boarding at the same house ; and that the said refuse matters often polluted the waters of the bay to such an extent as to affect the bathing, notwithstanding the house and bathing beach were located about two or three miles north-west from said starch works.

H. S. HORTON.

Sworn to before me, this 8th day of October, 1883.

LEWIS L. PIERCE,
Notary Public, City and County of New York.

In the matter of the application of John T. Pirie, Esq., and others.

STATE OF NEW YORK, }
County of Queens. }

I, Matthew D. Field, being duly sworn, doth depose and state as follows:

I resided for over two months during the past summer at Sea Cliff, Long Island; I am, by occupation, surgeon to the Manhattan Elevated railroad, one of the examiners in lunacy for the city of New York, and visiting physician to the Charity Hospital; — that I have, during the period of aforesaid residence, been familiar with the general character and effect of the refuse matters and gaseous exhalations originating with the factory for the making of starch and glucose, situated in the town of Oyster Bay, upon Hempstead bay, and commonly known as the Glen Cove Starch Works; that at times and on certain days when the tide was low and a north-east wind prevailing, said odors and exhalations have proved nauseating and suffocating to myself — and that I have heard frequent strong complaints from the residents of said town, and especially from persons boarding at the Sea Cliff House to the same effect; that in one case a patient of mine complained that said gaseous exhalations took away his appetite and produced a feeling of nausea during the entire day; — that in my estimation, said exhalations are and must be deleterious to health; that I have many times seen the water of the bay along the shore at Sea Cliff so polluted by the said refuse matter, that it was rendered unfit for bathing and disgusting to the sense of smell; that while out sailing one day on the waters of the bay near Sea Cliff the boat became somewhat becalmed and the water being saturated by said refuse, I and others with me became almost stifled by said exhalations; — and that said nuisance often lasted for hours during the day and frequently arose during the night.

MATTHEW D. FIELD, M. D.

Before me this 3d day of October, 1883, appeared Matthew D. Field, to me well-known, who declared that he executed the above instrument.

H. A. SCHUDEMANTER,
Notary Public, Kings Co. and New York Co., N. Y.

In the matter of the application of Frederick W. Geissenhainer, Esq., and others.

STATE OF NEW YORK, }
County of Queens. }

William H. Story, of 102 Montague street, Brooklyn, New York, being duly sworn, doth depose and state as follows:

I resided at Sea Cliff, N. Y., during the summer of 1883, and have there resided for a period of two or three months; I am by occupation a commission merchant in grain, and I have, during the period of such residence, been familiar with the general character and effect of the refuse

matter and gaseous exhalations originating with the factory for the making of starch and glucose, situated in the town of Oyster Bay, upon Hempstead bay, and commonly known as the Glen Cove Starch Works; that on several occasions the odors arising from said refuse matters were so offensive that I suffered loss of appetite from feeling of nausea, and every thing I attempted to eat tasted like the disgusting smell aforesaid, and on one occasion I felt as though, if I did eat, my stomach would eject the food because of being affected by the said odors, consequently, I refused to eat at all; and that I am of robust constitution and have a good stomach and enjoy good health; that my wife, recently deceased, suffered severely from such nauseating and suffocating odors; and that my daughter experienced headache, dizziness, nausea and intolerance of food from aforesaid causes during said period of residence at Sea Cliff; that the bathing in the waters at Sea Cliff was at times impracticable because of the defilement by said refuse matters, and the comfort and enjoyment of life of the residents are often and greatly impaired.

W. H. STORY.

Subscribed and sworn to before me, this 5th day of October, 1883.

L. B. Howe,
Notary Public (156), *New York City and County.*

Twelve affidavits of similar import.

In the matter of the application to the Governor of the State of New York, for the suppression of nuisances at Glen Cove, L. I.

City and County of New York, *ss.*:

Samuel N. M. Barlow, being sworn, says he is an attorney-at-law and has resided in Glen Cove for more than ten years; that his residence is about one mile, easterly, in a direct line from the starch works; that at times when the wind came from that direction the stench from the refuse matter from these works is unbearable; that sometimes the bed-room windows in deponent's residence are necessarily closed to exclude the said stench, which is virulent and nauseating; that deponent has no animosity toward said works or the owners thereof, but is on friendly terms with many of them; that he desires nothing done that shall be contrary to good neighborhood or that can interfere with the continuance of the works, under proper arrangements, which deponent is informed can be readily carried on, without the production of any nuisance and so that the offensive matters now ejected into the bay can be utilized and made profitable. In this view deponent joins earnestly in the complaint that has been made to the Board of Health.

SAMUEL N. M. BARLOW.

Sworn before me, this 8th day of October, 1883.

Mau'ce Spillane,
Notary Public, New York County.

In the matter of the petition of residents, etc., of Sea Cliff, Glen Cove, etc., to the Governor, for the intervention of the State Board of Health for the suppression of the nuisance arising from Glen Cove Starch and Glucose Works.

STATE OF NEW YORK, } ss.:
County of Queens, }

Elizabeth A. Dailey, of Sea Cliff, in the county of Queens and State of New York, being duly sworn, doth depose and say: That this deponent is one of the owners and managers of the hotel known as the Sea Cliff House; that the number of guests who reside in said hotel during the summer season is about two hundred and fifty, besides a large number of transient guests; that this deponent knows the manufactory located at Glen Cove about one mile and a half distant from said hotel, and which is commonly known as the Glen Cove or Duryea Starch and Glucose Works; that large quantities of offensive smelling liquid and refuse material are almost daily poured out of said manufactory into the waters of Hempstead bay, upon the shores of which Sea Cliff is situated; that the stench emanating from said liquid and refuse material is exceedingly oppressive and nauseating, and renders the enjoyment of life and property uncomfortable; that the guests at the Sea Cliff House have, during the past and previous seasons, loudly complained of the said stench, and have frequently been compelled to leave the table and dining-room when said stench has been suddenly blown toward the said hotel and permeated the air therein; that several guests have been compelled to leave the hotel and place owing to the intolerable annoyance caused by said stench and their consequent apprehension of serious injury to health therefrom.

ELIZABETH A. DAILEY.

Sworn before me, this 13th }
day of September, 1883. }

GEORGE W. BROUWER,
Notary Public.

In the matter of the investigation by the State Board of Health in relation to alleged nuisance emanating from the Duryea Starch and Glucose Manufactory at Glen Cove.

CITY AND COUNTY OF NEW YORK, *ss.:*

William I. Preston, being duly sworn, doth depose and say:

That during the past summer he was a boarder at the Sea Cliff House, at Sea Cliff, Long Island; that on many occasions this deponent, while residing in said hotel, was subjected to great physical annoyance and inconvenience by reason of the offensive and nauseating odors which were blown from the direction of the Duryea Starch and Glucose Manufactory, located at Glen Cove, Queens county, and which deponent verily believes emanated from said manufactory; that said smells are an intolerable nuisance; they render respiration oppressive and dis-

agreeable; they impair one's appetite; they render the enjoyment of life uncomfortable, and are deemed by nervous, delicate people injurious to health.

This deponent further swears that he is now, and has been for the past two years president of the Sea Cliff Grove and Metropolitan Camp Ground Association, and has been familiar with the locality for the past ten years; that he has had many complaints made to him by people who have spent a portion of the summer there of the smells emanating from said manufactory, and in some cases parties have stated they would not come again on account of the offensive odors coming from said manufactory; that he knows persons who own property at Sea Cliff who refuse to build by reason of said smells, and who offer to sell their property; that said parties say they would build and make Sea Cliff their permanent summer home if the starch factory smells were abated.

WILLIAM I. PRESTON.

Subscribed and sworn to before me, this 10th day of October, 1883.

HENRY A. HIMMELMANN,
Notary Public (48), *New York County.*

I, C. L. Perkins, merchant, depose and say:

That I reside in the town of Glen Cove, Queens county, Long Island; that my residence is about two and one-half miles from the works of the Glen Cove Starch Company; that when the wind blows from the direction of the factory the stench is very bad; so much so that in several instances it has been necessary to close the windows; I believe this stench comes from the factory or from the deposit on the flats of the refuse from the works; I have no animosity against the proprietors, and I have no desire to injure their business, and I recognize the fact that it gives employment to a great many people who are dependent on it, but I am told and believe that the business can be carried on and the refuse disposed of so as not to cause annoyance to the neighborhood.

C. L. PERKINS.

Subscribed and sworn to before me, this 9th day of October, 1883.

E. W. ORVIS,
Notary Public, New York County.

In the matter of the application of Dr. A. W. Lozier and others.

STATE OF NEW YORK,
County of Queens.

Nelson L. North, M. D., of the city of Brooklyn, N. Y., doth depose and state as follows:

I have resided at Sea Cliff, N. Y., for a period of several months dur-

ing the summer seasons of 1882 and 1883, and I have, during the period of such residence, been familiar with the general character and effect of the refuse matter and gaseous exhalations originating with the factory for the making of starch and glucose, situated in the town of Oyster Bay, upon Hempstead bay, and commonly known as the Glen Cove Starch Works; that the said exhalations are at times very disgusting and nauseous; the waters of the bay are polluted and sickening beyond measure, and the effect of the sludge acid and refuse from the said starch and glucose works is in every way detrimental to the health of human beings, and is destructive to the fish in the waters of the bay, the dead carcasses of which, decaying along the coasts of the bay, cause a new and increased danger to the health and life of those inhabiting the vicinity; I have more than once attempted to bathe in company with my family and friends in the otherwise placid, healthful and beautiful waters of the bay, and have been driven off by the filth and stench coming from these works; in fact, upon certain days of the week, and with certain winds, Sea Cliff village and the waters surrounding it are well nigh uninhabitable for human beings, and besides the property is decreased in value, and the holders thereof are harmed in health, in value of property and in peace of mind, arising from this nuisance — the Glen Cove Starch and Glucose Works.

NELSON L. NORTH.

Sworn to before me, this 9th day of October, 1883.

GEORGE H. NILES,
Notary Public, Kings County.

To the Honorable, the State Board of Health, Albany, N. Y.:

DEAR SIR — The association committee and the joint committee appointed at a public meeting of the citizens of Sea Cliff and community to represent their interests and appeal to Governor Cleveland for the suppression of the nuisances arising from the starch and glucose works at Glen Cove, L. I., affecting and endangering the health of the community, would respectfully represent that, since the meeting held by your Board at Glen Cove, at which verbal testimony of citizens was given, and since the additional affidavits were handed you by us, and indeed only at the present moment has a knowledge of certain objections and statements made, it is understood by others to your Board opposed to the remedying of said grievance and likely to affect, to a great extent, your conclusions, been brought to our attention; which statements seem to require answer on our part since they, in our opinion, are based upon misconception or misstatements of facts. These statements did not appear at the time of the verbal hearing except as to the first statement, or the committee would have answered them. Such statements are in the nature of arguments and this committee is informed and believes, are as follows:

First. That the complaints as to the unhealthfulness of the refuse matter or gaseous exhalations engendered by said works are baseless,

that they do not injure the health of the neighborhood nor poison the water so as to kill fish or oysters. That if the health of Sea Cliff is affected it may be due to its own cess-pools.

Second. That among the persons who chiefly complain of this grievance and are prominent in its desired suppression is a large number of persons who reside at Sea Cliff for from one to three months only during the summer, some of whom own houses there, but are not permanent residents. That rich people chiefly bring these objections, and by inference do not alike represent the cause of the poor.

Third. That some people who have lived in said vicinity for years have not appeared in this complaint.

Fourth. That a great number of counter petitions, verbal testimonies and affidavits have been made by citizens of Glen Cove and vicinity contradicting the affirmations and affidavits of the complainants.

Fifth. That there is an unfriendly neighborhood feeling between Sea Cliff and Glen Cove.

Sixth. That if such nuisance existed as alleged, the growth of Sea Cliff would be greatly affected thereby, but that on the contrary, several houses are now being erected there and the growth is not interfered with.

Seventh. That about one thousand persons are directly interested in the said works either as employees or otherwise industrially or commercially; that said works are a necessary industry and ought consequently not to be interfered with by your action in the premises. This committee desires to herein answer such statements, if such have been made, to your Board and respectfully offer confirmatory affidavits if called for by you. The committee desires to state that said allegations have been necessarily *ex parte*, and that this committee has not had the privilege of knowing them or any other which may have been made, or of cross-questioning or rebutting them except as to the first and chiefly important statement; while it is well aware that its own statements are open to the same criticism, it still deems it no more than right that it should be also heard and desires chiefly that the truth shall be arrived at by your honorable Board. It has no word of complaint or criticism to utter, but desires to commend the spirit shown by your honorable Board in arriving at a conclusion. This committee desires for sake of clearness to briefly reply to each statement in its order.

First. We deem the evidence submitted to you by us as of a most positive and convincing character. No less than seven well-known reputable physicians testifying most unequivocally as to the deleterious effects of said gaseous exhalations besides the affidavits of many citizens of Glen Cove and Sea Cliff and community as to the effect upon their health, comfort and business and property interests. The statement that the cess-pools of Sea Cliff were the cause of such nuisance seemed to be too trifling and absurd to seriously notice unless requested by you to answer it. It was never dreamed or thought of by any one that we have heard of except to suit this occasion. Whenever the wind blew upon us from the Glen Cove works and the creek brought down its refuse, we suffered from these nauseating sickening exhalations and not otherwise.

Second. The permanent population of Sea Cliff is, according to the recent census establishing it as a village, nearly 700. During the summer months it is estimated by Mr. Geissenhainer that over 4,000 people

reside there, many of whom own summer residences. At the verbal hearing many of the prominent citizens permanently living there appeared. The notice given and the time of hearing was short or many more would have appeared if they had had the opportunity. Mr. Geissenhainer, the present president of the village of Sea Cliff, Mr. Pirie, one of its trustees, Mr. DuBois, Mr. Yost, Mr. Hadden, Hon. John G. Boyd, Dr. Lozier and others, most of them permanent residents and representing the Sea Cliff Association and vicinity were present and testified on that occasion. Those who could not come afterward sent voluminous affidavits. Among others, Mr. Wm. J. Preston, president of the Sea Cliff Association, S. L. M. Barlow, Chas. Appleby, Mr. Perkins of Glen Cove, Miss Dailey of the Sea Cliff House, and others. The question was not in any sense one of the cause of the rich as distinct from the poor. All matters of health and good neighborhood must be alike that of every home.

Third. That the people of Glen Cove generally did not appear without being subpœnaed simply shows a natural reluctance to volunteer evidence where large commercial and industrial interests are involved. Many prominent residents expressed to one of this committee their willingness to testify if properly summoned.

Beside that Glen Cove and the neighborhood north and east of it are measurably protected from said gases by reason of the dyke erected by said works and do not begin to suffer from such nuisance as Sea Cliff must necessarily. When the said extensive dyke is let out the water rushes through the Glen Cove creek carrying down vast quantities of refuse matters, and ploughing out the bed of the creek, when sediment has collected, throws it out upon the surface of the bay directly in front of Sea Cliff, one mile from Glen Cove, poisoning the water to the extent of killing fishes and oysters, filling it with large masses of vile material floating about in cakes, turning the water a milky color and daily affecting the bathing, besides emitting a sickening odor. As the tide recedes this refuse is left on the shore (and often dead fish) and is evaporated and concentrated on the beach, and the gases therefrom driven by the wind directly upon the houses of Sea Cliff. Therefore no other district is equally affected. For this reason many persons not so disastrously affected did not appear.

Fourth. That contradictory affidavits should have been offered only proves that people so testifying were not so situated as to suffer so much as others, or that commercial and industrial interests often affect one's views and feeling in regard to a given subject.

Fifth. No feeling of animosity or unfriendliness against the managers of said works on the part of residents of Sea Cliff exists so far as this committee is aware. There is a natural feeling of indignation that our community should have to suffer so severely at their hands when the evil can and should be remedied, as we believe. A local feeling in regard to the injustice of school tax-assessment has existed for some time, Sea Cliff having to maintain its winter school, at an expense of $1,200, by voluntary contributions. This injustice doubtless will be remedied by the next Legislature.

Sixth. The growth of Sea Cliff *has been very seriously* affected by said nuisance; in some parts it is almost wholly paralyzed. Along the north shore, most attractive for residents because of view, bathing and

location, not a single house has been erected since the aggravated trials of last summer except only a small cottage. Many people who own lots there are wholly prevented from building and are selling at greatly reduced rates. The five or six small houses being erected elsewhere in the village are back some distance from the shore and are not affected unpleasantly by the odors borne by the winds. The growth of the town is not at all commensurate with its natural advantages, which are unsurpassed by any town within one hour's ride of New York. Mr. Geissenhainer has bought land removed from the shore and intends to build a new house for himself, being driven to do so because of this nuisance. And the same remark applies to other improvements. We desire to call your attention to the affidavits of Mr. John Foord, editor of the Brooklyn *Union*, and Mr. Charles Appleby, of Glen Cove, touching the effect upon real estate valuation. Also the affidavit of Miss Dailey as to hotel and bathing interests.

Sea Cliff is easily approached by railroad and steamboat at low fares. It occupies a high, healthy sandy bluff, giving fine dry air and views. It has a superb bathing beach, has almost entire freedom from mosquitos. None of the permanent residents, so far as this committee is informed, has ever had chills and fever there produced. It has a fine head of the best drinking water drawn from eight driven wells and driven by steam pump up a reservoir to supply the town, and it has strict prohibition enjoined by its Association Charter. While Hempstead bay offers a fine sheet of water for yachts and sailing. Its only drawback is from the nuisance arising as aforesaid, which blights all else.

Seventh. This committee is credibly informed that not over two hundred and fifty or three hundred persons are employed as operatives at the starch works as a regular thing. It is not our desire to remove or suppress the works or interfere with their prospering so long as other remedies can be found, as we are informed and believe they can be.

Approved and ordered signed by the Joint Committee at a meeting held this November 16, 1883.

WM. J. PRESTON, *Chairman.*
A. W. LOZIER, M. D., *Secretary Committee.*

IN BEHALF OF DEFENDANTS.

To his Excellency, GROVER CLEVELAND, *Governor of the State of New York;* and to the Honorable, THE STATE BOARD OF HEALTH *of the State of New York:*

WHEREAS, A petition purporting to have been signed by S. L. M. Barlow, Charles L. Perkins and Charles E. Appleby, residing at or near Glen Cove Landing; John G. Boyd, John T. Pirie, J. O. Cloyd, W. I. Preston, F. W. Geissenhainer, L. C. Coe, Casper Yost and John Foord, residing at Sea Cliff, L. I., has been presented to the Governor of the State of New York, charging "that vast quantities of spent acid and offensive refuse material are continually produced by the Glen Cove Manufacturing Company in the operation of its manufactory (at Glen

Cove, L. I.), and poured into the waters of Hempstead bay; that said acid and refuse material pollute the waters of the bay to such an extent as to be detrimental to the oyster and fishing interest, and frequently render the water on the Sea Cliff shore unfit for bathing purposes; that the foul stench and gases emanating from said acid and refuse material so permeates the atmosphere as, at times, to render respiration oppressive, produce nausea, and cause great physical hurt and inconvenience; that the exhalations traceable to said operation of said manufactory are exceedingly annoying and offensive, and seriously interfere with the enjoyment of life and property; that they are highly prejudicial to the sick and destructive of the comfort of the healthy, and an intolerable nuisance to the residents and property holders of said locality;" and,

WHEREAS, Said petitioners "pray that the Governor forthwith require the State Board of Health to examine into said alleged nuisance and report to him the results of such examination, to the end that said nuisance, and the persons controlling the same, may be dealt with according to the provisions of the statute in such cases made and provided;" and,

WHEREAS, The Governor has referred the matter charged in said petition to said State Board of Health for their examination and report;" and,

WHEREAS, The allegations contained in said petition, charging that the operations of said manufactory and the materials used therein are prejudicial to the health and destructive of the comfort of the inhabitants in and about Glen Cove, and an intolerable nuisance to the residents and property holders of that locality, are to the best knowledge and belief of the undersigned (protestants against said petition), untrue and without any foundation of fact to support the same.

Now, therefore, we, whose names are undersigned, protesting against the aforesaid petition, respectfully show to his Excellency, the Governor, and to your honorable Board, that we have resided in and about Glen Cove and near to said above-mentioned manufactory for the period set opposite our respective names; are property owners and engaged in business as indicated on the line opposite our respective names; that during all the time of our residence at or near said Glen Cove we have not, nor has any member of our families suffered in health, been discomforted in the enjoyment of life, or injured in property by reason of the operation of said manufactory.

513 signatures.

CITY AND COUNTY OF NEW YORK, *ss.:*

Edward R. Garczynski, being duly sworn, says:

I am a reporter on the New York *Tribune* and in the usual course of work, was detailed by the city editor to attend an indignation meeting held at Sea Cliff, with regard to the alleged nuisance created by the Glen Cove Starch Works; I was further instructed by the city editor to visit the starch factory and interview the Messrs. Duryea; on my arrival at the principal hotel at Sea Cliff, I was met by Mr. Preston, the

president of the Sea Cliff Land Association, who explained the situation to me; he confessed that he could not define the nuisance nor state how it was created, but promised that this should be explained by Dr. Lozier at the meeting; I was introduced to other gentlemen connected with the movement against the starch works, and found the same uncertainty in the minds of all with regard to the nuisance; it was impossible to tell from the statements of any of these gentlemen whether the offensive smell of which they complained was borne by the winds from Glen Cove to Sea Cliff, or whether the currents of the bay carried a foul scum which lodged on the Sea Cliff shore and gave forth a bad smell; I questioned politely many of the guests at the hotel, which is a well-known summer resort of excellent reputation; not one of them remarked any unpleasant odors, or had noticed any thing in that place different from other places; I questioned some of the female servants of the hotel, and they said that there was a bad smell at times which made the rooms at the back of the hotel unpleasant, and it became necessary to close the windows even in the hottest weather; I myself perceived no bad odor of any kind and said so, and Mr. Preston told me that the stench was chiefly perceptible when it was warm and foggy.

I attended the indignation meeting held in the church; speeches were made by Senator Boyd, Dr. Lozier and Mr. John Foord, of the Brooklyn *Union;* I knew the latter personally, and the two former by reputation, Senator Boyd as connected with an anti-monopoly party in New York, which does not possess the public confidence in any appreciable degree, and Dr. Lozier as a frequent speaker at women's rights meetings and a nervous expounder of the doctrine that all political ills will be cured by giving votes to women; I was not, therefore, much surprised at the tone of the speeches which were wild and inflammatory; Senator Boyd spoke of giant monopolies and corporate greed; Dr. Lozier compared Sea Cliff with a little David that was going to slay the great Goliath of the Glen Cove company; Mr. John Foord said there was no hope of deriving any benefit from conference or correspondence with the Messrs. Duryea, because they were too pig-headed to pay attention to any remonstrance; as no attempt had been made to define the nature of the alleged nuisance which was alluded to repeatedly under the very general term of sludge acid, which in my understanding of the term was only applicable to the refuse from oil refineries, I rose from my seat at the reporters' table and whispered to Mr. Preston, who was presiding, that I could not telegraph my report unless some definition was given, because however well it might be known to the people of Sea Cliff, the readers of the *Tribune* could not be supposed to know any thing about it; Dr. Lozier then came to the reporters' table and said the nuisance was caused by a scum of the sulphuric acid used in breaking up the granule of starch from the corn with the refuse; he stated that the whole of the refuse was poured in the creek, and that this scum was deposited on the shores of Sea Cliff by the ebb-tide and gave rise to the most offensive odors; after dispatching my telegraphic report to the *Tribune*, I had a conversation with Mr. Preston which lasted for an hour; he also stated that all that was not converted into starch was poured into the creek, and said that the Messrs. Duryea ought to be compelled to send their refuse through piping into the sound; I

told him that this was bad hygiene, that the only true system was to neutralize offensive matter, and utilize it if possible, and if not, dump it on waste ground; from what he said at that time I thought this view impressed him favorably ; I confess I learned with some surprise from him that no correspondence on the subject had ever taken place with the Messrs. Duryea, but he said that they were men so obstinate and self-willed that nothing could be done with them.

I rose very early the next morning and wandered about Sea Cliff ; I found in the wild ground behind the hotel, evidences of very filthy habits, and also I perceived some odor that I thought came from a cess-pool ; it struck me that the smell at the back of the hotel which made it necessary to close the windows came from this cause and not from any thing more remote ; I went down the hill to the dock and found on each side of it, for a limited space along the then uncovered shore, a smell that was pungent and nauseating in a high degree, in which I certainly thought I detected the presence of urea ; I could not avoid the conviction that it resulted from the seepage of cess-pools; there was no odor arising from the water, which was then at the ebb, nor was there any discoloration nor any scum of any kind whatsoever ; boys were fishing at the head of the pier and catching small fish that were darting about in hundreds ; I went along the shore to Glen Cove and smelled no effluvia until I reached the mud flats at the head of the creek ; had the wind been favorable, I should undoubtedly have been aware of their presence long before, for the odor was decidedly unpleasant, and had a high carrying power ; this is a term used by perfumers ; there are many very exquisite essences so delicate that musk has to be used as a vehicle to carry them, because it has a high carrying power; but they so thoroughly envelope the molecules of the musk that carries them, that it is imperceptible ; such is the carrying power of the odor from the mud flats that when the wind blows toward Sea Cliff it must be very discernible there ; I have often noticed the effluvia of mud flats, in various places, notably Newark flats, and in the neighborhood of the salt marshes down by Perth Amboy ; I always attributed this to the decomposition of minute marine organisms.

I made myself known to Mr. John Duryea and was shown by him the various processes of the manufacture, and he pointed out to me most impartially the substances that drained into the creek. These were albuminous with a mere faint trace of starch. I found out with indignant astonishment that the Messrs. Duryea saved their refuse, and sold it as a highly appreciated food for cows. It seemed to me at that time that the speakers of the night before had either willfully deceived their audience and the representatives of the press, or had been animated by such feelings of animosity toward the Messrs. Duryea, that they had been unwilling to learn the facts in the case. The references to sludge acid I now comprehend, and I realized that they had formed their views of the Glen Cove Starch Works, not from the actual facts, but from reports of other factories that had been prosecuted as nuisances.

I have seen Dr. Lozier since the meeting and had a conversation with him. He expressed himself much more respectfully about the Messrs. Duryea, and spoke of them as most estimable citizens for whom every one entertained a high regard. He thought that it would be easy for them to construct a pipe that should carry their refuse into the

sound. I showed him that the current of the creek did that already. I had studied the bearings of the bay, and was able to prove to him that whatever matters might be brought to Sea Cliff could only be such as were caught at slack water at the entrance to the sound and were brought back into Hempstead harbor by the flood tide. He then said it might be done in scows. I asked him if he had studied the system of the Messrs. Duryea, and found out how very much of their refuse they saved and utilized, and how small, how very small, a proportion went through the drains into the creek. I told him that whatever was saved was an economy and a source of profit, and he might rely upon it that any system that would increase the savings would immediately commend itself to the notice of such admirable business men as the managers of the Glen Cove Company.

EDWARD R. GARCZYNSKI.

Sworn to before me, this 3d day of October, 1883.

WM. J. CANNON,
Notary Public, New York County.

STATE OF NEW YORK, *County of Queens*, } *ss.* :

Caroline Merritt, being duly sworn, deposes and says that she resides at Glen Cove, in said county; that she is of the age of fifty-nine years, and has resided at said Glen Cove and within one-half mile of the premises and works of the Glen Cove Manufacturing Company at that place for twenty-eight years; that deponent owns real estate at Glen Cove and is engaged in farming; that deponent is acquainted with the external operations of said company at Glen Cove, and has been so acquainted for twenty-eight years last past, and is also acquainted with Glen Cove creek, on which said company's manufactory is situated, and with Hempstead harbor, into which the waters of said creek flow; that the operations of said manufactory are not in any way prejudicial to the health or physical comfort of this deponent; that deponent is quite generally acquainted with the inhabitants of Glen Cove residing in and about the vicinity of said manufactory; that deponent has never known or heard of any person being made sick or uncomfortable at Glen Cove or elsewhere from or by reason of the operations of said manufactory; that in the neighborhood of said manufactory there have from time to time occasionally arisen from said creek and the marshes and mud flats adjacent thereto certain disagreeable odors, and in the belief of deponent not from the result of the operations of said manufactory; that said creek and adjacent marshes and mud flats have within the recollection of deponent emitted such odors for a period of more than forty years, and to the knowledge of deponent at least twelve years before the establishment of said manufactory; that since the establishment of said manufactory, for the manufacture of starch and glucose, said odors have to the knowledge of deponent become materially less; and gradually less frequent and less disagreeable; so much so as not to interfere with the enjoyment of health, comfort or property,

that the paint upon buildings in the neighborhood of said creek, or upon the boats used in the waters thereof, are affected in no way different from buildings and boats in or about the waters of other creeks and mud flats on Long Island. As to this deponent cannot say; that deponent has no pecuniary interest in said company, or its operations.

MRS. CAROLINE MERRITT.

Sworn to before me, this 19th day of October, 1883.

E. T. PAYNE,
Notary Public, Queens County, N. Y.

Forty-five affidavits of similar import.

STATE OF NEW YORK, *County of Queens*, } *ss.:*

William Cock, being duly sworn, says that he resides at Glen Cove in said county, and has so resided for more than fifty years; that he is of the age of fifty-three years; that he has been engaged in the clam and oyster business in and about the waters of Hempstead harbor and the waters adjacent thereto, for the past forty years; that he is now a member of the firm of Cock Brothers, who are engaged in said business at Glen Cove, carrying on the same in the aforesaid waters; that said firm is composed of deponent and his brothers Isaac and Stephen Cock; that he is well acquainted with the Glen Cove Manufacturing Company's manufactory at Glen Cove aforesaid, and also acquainted with the premises and creek on which the same is located, and with its external operations and with the waters of the creek on which said manufactory stands; that said firm of Cock Brothers own, occupy and work a large bed of oysters situated in the waters of Hempstead harbor, about one-fourth of a mile from the mouth of Glen Cove creek, where the waters of said creek empty into said harbor; that the waters of said creek with each recurring tide (twice in every twenty-four hours) flow over said oyster bed; that said oyster bed was planted at said point and place twenty years ago; that the same has ever since been maintained, and is now in as good and healthy condition as at any previous time; that the interest of said business has in no way been injured by any of the operations of said manufactory; that the oysters growing on said bed have never been destroyed or injured by the operations of said manufactory or by the waters or ingredients or substances in the waters of said creek flowing over said oysters as aforesaid.

WILLIAM COCK.

Subscribed and sworn to before me, this, the 27th day of September, 1883.

E. T. PAYNE,
Notary Public, Queens County, N. Y.

STATE OF NEW YORK, } ss.:
County of Queens, }

William Cock, Isaac Cock, Stephen Cock, Julius Webster and Horatio Losee, being severally duly sworn, depose and say that they reside at or near Glen Cove in said Queens county; that they now are, and for many years last past, have been engaged in the clam and oyster business in and about the waters of Hempstead harbor, and at and near the mouth of Glen Cove creek where the waters of said creek empty into said Hempstead harbor; that deponents are well acquainted with the Glen Cove Manufacturing Company, a corporation engaged in the manufacture of starch and glucose, having its manufactory at Glen Cove on the aforesaid creek; that deponents are, and for about twenty years have been acquainted with the works and external operations in and about the premises and manufactory of said company at said Glen Cove; that to the best knowledge and belief of deponents there is nothing in the operations of said manufactory, or connected therewith, prejudicial to their said business or detrimental to its interests or destructive of the oysters and clams grown and found in the waters of said harbor, or injurious to the health and growth of the clams and oysters now growing in said waters.

WILLIAM COCK,
STEPHEN COCK,
ISAAC COCK,
JULIUS WEBSTER,
HORATIO LOSEE.

Sworn to before me, this 27th day of September, 1883.

E. T. PAYNE,
Notary Public, Queens County, N. Y.

STATE OF NEW YORK, } ss.:
County of Suffolk, }

Robert N. Corey, Jesse C. King, Benjamin I. Hallock, Alvah Case, William H. Bartlay, James B. Hudson and D. B. Rogers of Greenport in the county and State aforesaid, being duly sworn, each for himself, says:

That they are engaged in the business of fishing for menhaden or moss bunkers, and have been engaged in said business for several years last past; that in the course of their business they have fished for said fish in nearly all the harbors and bays on the coast of Long Island; that they have often caught them in Hempstead harbor or bay, and have found them as good and plentiful there as in any bay or harbor on the coast of Long Island; indeed that they are considered more abundant and better there than in other places, and the said harbor is a favorite fishing ground for them; that they have observed that said fish are most numerous in said harbor near the mouth of Glen Cove creek, and

that they have never known or heard of fish caught there that were or appeared to be in any way affected, or injured or different from the fish caught in other waters.

ROBERT N. COREY,
JESSE C. KING,
BENJ. I. HALLOCK,
ALVAH CASE,
WILLIAM C. BARTLAY,
JAMES B. HUDSON,
D. B. ROGERS.

Subscribed and sworn to before me, this 13th day of October, 1883.

BENJAMIN H. REEVE,
Notary Public, Suffolk County, N. Y.

STATE OF NEW YORK, *County of Suffolk,* } *ss.:*

Captain Benjamin F. Conklin, being duly sworn, says.

That I reside in Jamesport in the county and State aforesaid, and am captain of the fishing steamer "Edwin Dayton," and also am engaged with said steamer in the business or pursuit of fishing for menhaden or moss bunkers; I have been engaged in said business, steady, for thirty-three years; during said time I have fished and caught said fish in nearly all the waters adjacent to Long Island's coast; I have caught said fish in Hempstead bay near the mouth of Glen Cove creek in large quantities, and have found them as plentiful and good there as in the other harbors and bays of the same size; I have never seen or heard of fish caught there that were diseased or injured in any possible manner, or different from the fish caught in other waters.

CAPTAIN BENJAMIN F. CONKLIN.

Subscribed and sworn to before me, this 22d day of October, 1883.

BENJAMIN H. REEVE,
Notary Public, Suffolk County, N. Y.

STATE OF NEW YORK, *County of Suffolk,* } *ss.:*

William R. Benjamin and Joseph A. Brocey, being duly sworn, each for himself, say:

That they reside at Greenport in the county of Suffolk and State of New York, and are captains of the fishing steamers "George W. Beale" and "Estelle," respectively, said steamers hailing from the port of Greenport, N. Y.; that they are engaged with said steamers in the fishing business fishing for moss bunkers or menhaden; that we have been engaged in said business for twenty years; that we have in the

course of our business caught such fish in almost every bay and harbor along the coast of Long Island, and have often caught them in Hempstead harbor, and also have found them as good and plentiful there as in any bay or harbor on the coast of Long Island, and further, indeed, have found them more abundant and better there than in other places, and that the said harbor is a favorite fishing ground for them; that they have often observed that said fish are more and most numerous in said harbor near the mouth of Glen Cove creek, and they have never known or heard of fish caught there that were, or appeared to be, in any way affected or injured.

WM. R. BENJAMIN,
JOSEPH A. BROCEY.

Subscribed and sworn to before me, this 18th day of October, 1882.

BENJAMIN A. REEVE,
Notary Public in and for Suffolk County, N. Y.

STATE OF NEW YORK, *County of Suffolk,* } *ss.:*

William Kane, being duly sworn, says:

I reside at East Marion, Suffolk county, N. Y.; I am mate of the fishing steamer "John L. Lawrence," said steamer hailing from Greenport, N. Y.; I am engaged with said vessel in the fishing business, viz.: fishing for moss-bunkers or menhaden; I have been engaged in said business for eight years; in the course of my business I have caught such fish in almost every bay and harbor on the coast of Long Island; I have often caught them in Hempstead harbor, and have found them as good and abundant there as in any bay or harbor on Long Island's coast, and, indeed, they are considered more abundant and better there than in other places, and the said harbor is a favorite fishing ground for them; I have often observed that said fish are most numerous in said harbor near the mouth of Glen Cove creek, and I have never known or heard of fish caught there that were, or appeared to be, in any way affected by disease or injured in any manner.

WILLIAM KANE.

Subscribed and sworn to before me, this 13th day of October, 1883.

BENJAMIN H. REEVE,
Notary Public.

STATE OF NEW YORK, *County of Suffolk,* } *ss.:*

William H. Conklin, being duly sworn, says:

That he resides at Greenport in the county and State aforesaid, and is engaged in the business of fishing for menhaden or moss-bunkers; that he is the mate of the fishing steamer "Wm. A. Wells" of the port of Greenport, N. Y., and is engaged with said steamer in the business

aforesaid; that he has been engaged in said business for upwards of twenty years, and during said time has caught such fish in almost every bay and harbor on the coast of Long Island; that he has caught said fish in Hempstead harbor, near the mouth of Glen Cove creek, and in said creek within a few rods of the Glen Cove Starch Factory; that he has found the fishing in Hempstead bay or harbor as good and the fish as abundant there as in any other harbor or bay along Long Island's coast; that at times fish are very abundant there, and that said harbor is a favorite fishing ground for said fish; that he has often observed that said fish are as numerous near the mouth of said Glen Cove creek as in any other part of said bay or harbor; and that he has never known, saw or heard of fish caught there that were diseased, injured or differed from the fish caught at other places and in other waters near or distant from there.

WM. H. CONKLIN.

Subscribed and sworn to before me, this 13th day of October, 1883.

BENJ. H. REEVE,
Notary Public, Suffolk Co., N. Y.

STATE OF NEW YORK, *County of Suffolk,* } *ss.:*

Samuel W. Wilson of Greenport, in the county and State aforesaid, being duly sworn, says:

That he is second captain of the fishing steamer "Ranger," hailing from Greenport, N. Y.; that he has been engaged in the business of fishing for moss-bunkers or menhaden for eight years; that, during said eight years, he has helped catch fish, viz., moss-bunkers or menhaden, in nearly all the bays and harbors on the coast of Long Island; that he has often caught them in Hempstead harbor and in the vicinity of Glen Cove creek which empties into said harbor; that he has found the fish caught there to be the same as those caught in other waters and not diseased or injured in any possible way.

SAMUEL W. WILSON.

Subscribed and sworn to before me, this 13th day of October, 1883.

BENJ. H. REEVE,
Notary Public in and for Suffolk Co., N. Y.

STATE OF NEW YORK, *County of Suffolk,* } *ss.:*

Fred. O. Hallock, of Flanders in the county and State aforesaid, being duly sworn, says:

That he is the captain of the fishing steamer "Sterling" of the port of Greenport, N. Y.; that he has been engaged in the business of catching moss-bunkers or menhaden for the eight years last past; that

during said time he has aided in catching them in Hempstead bay or harbor, and at the mouth of Glen Cove creek at the head of which is situated the Glen Cove Starch Factory; that he has found them plentiful and as good there as at any other fishing ground that he has fished on; that none of the fish he has aided in catching in said harbor or near the mouth of said creek were diseased or injured, and that they were the same as the fish caught in other waters.

FRED. O. HALLOCK.

Sworn to and subscribed before me, this 13th day of October, 1883.

BENJ. H. REEVE,
Notary Public, Suffolk Co., N. Y.

STATE OF NEW YORK, *County of Suffolk,* } *ss.:*

Anson T. Wells, Joshua G. Baker, S. H. Macomber, E. J. Griffing, Captain Benjamin Tallman, jr. and Captain Detmold Reeve, of Greenport in the county and State aforesaid, being duly sworn, each for himself says:

That they are engaged in the business of fishing for menhaden or moss-bunkers, and have been engaged in said business for several years last past; that in the course of our business we have caught such fish in nearly all the harbors and waters adjacent to the Long Island coast; that they have often caught said fish in the waters of Hempstead harbor or bay or have usually found them as plentiful and abundant in said harbor and bay as in the other waters they have fished in; that during the year last past said Hempstead bay or harbor has been as good fishing ground as any other harbor or bay on the Long Island coast; that they have never known or heard of fish being caught in said harbor or bay or in or near the mouth of Glen Cove creek that were diseased, injured or in any way different from the fish caught in other waters be they far or near.

ANSON T. WELLS,
JOSHUA G. BAKER,
S. H. MACOMBER,
E. J. GRIFFING,
CAPT. BENJAMIN TALLMAN, JR.,
CAPT. DETMOLD REEVE.

Subscribed and sworn to before me, this 13th day of October, 1883.

BENJ. H. REEVE,
Notary Public, Suffolk Co.

STATE OF NEW YORK, *Suffolk County,* } *ss.:*

Jonathan Preston, of Greenport, N. Y., being duly sworn, says:

I was formerly the captain of the vessel called the "Mary A. Lesson" and was engaged with said vessel from 1868 to 1871 inclusive, in the

fishing business, fishing for menhaden or moss-bunkers; during said years I fished principally in the waters of Hempstead harbor or bay for such fish and found them as plentiful there as in the waters of other bays and harbors on the coast of Long Island; I know that said bay and harbor is good fishing grounds, and I have never known, seen or heard of any fish being caught there that were in any way unsound, sick or that differed or could be distinguished from the fish caught at other places.

JONATHAN PRESTON.

Subscribed and sworn to before me, this 13th day of October, 1883.

BENJ. H. REEVE,
Notary Public, Suffolk County, N. Y.

STATE OF NEW YORK, *County of Suffolk,* } *ss.:*

Monroe L. Biggs, being duly sworn, says:

I reside at Greenport in the county and State aforesaid, and am now captain of the yacht "Estelle;" I followed the business of fishing for moss-bunkers or menhaden for eight years, from 1865 to 1873 inclusive. I was at one time captain of the sloop or vessel called the "Jennie," and with said vessel was engaged in the said business; I fished principally during the above-mentioned eight years in the waters of Hempstead harbor or bay, or in that vicinity, and made a harbor nearly every night near the mouth of the Glen Cove creek in said harbor or bay; I have caught, or assisted in catching, many of the said fish in said harbor or bay, and especially near the mouth of the Glen Cove creek; I found the fish as plentiful and as good in said bay or harbor as at any other fishing ground; I have never caught or heard of fish being caught in said harbor or bay, or near the mouth of Glen Cove creek, or in said creek, that were diseased, sick, injured or in any manner affected or different from the fish caught in other waters.

CAPTAIN MONROE L. BIGGS.

Subscribed and sworn to before me, this 13th day of October, 1883.

BENJ. H. REEVE,
Notary Public in and for Suffolk County, N. Y.

STATE OF NEW YORK, *County of Suffolk.* } *ss.:*

Willis Gamoge and William E. Foster of Greenport, N. Y., being duly sworn, each for himself deposes and says:

That he is engaged in the business or pursuit of fishing for menhaden or moss-bunkers, and that he has been engaged in said pursuit for several years last past; that he has often caught said fish, or aided in catching them, in the waters of Hempstead bay or harbor, and also in or near the Glen Cove creek in said bay or harbor; that he has caught

said fish all along the coast of Long Island, and in the bays, harbors, sounds and ocean adjacent thereto, and that he knows the said Hempstead bay or harbor to be a good fishing ground for said fish; and that they are as abundant there usually as at other places, and the fish as good, indeed they are considered more abundant and better there than in the bays and harbors of the same size; that he has never caught or heard of fish caught in said bay or harbor that were or appeared to be sick, injured, affected or different from the fish caught in other waters adjacent to the Long Island coast.

WILLIS GAMOGE,
WILLIAM E. FOSTER.

Subscribed and sworn to before me, this 20th day of October, 1882.

BENJ. H. REEVE,
Notary Public, Suffolk County, N. Y.

STATE OF NEW YORK, *County of Suffolk*, } *ss.:*

Sumner Bailey, being duly sworn, says:

I reside at Bristol, Maine; I am the mate of the fishing steamer "Lizzie Wyman" of the port of Greenport, N. Y.; I am employed with said steamer in the business of fishing for moss-bunkers or menhaden, and have been engaged in said business for the past twelve years; during said time I have aided in catching said fish in the most of the bays and harbors, where such fish abound from the upper coast of Maine to Sandy Hook; I have helped catch thousands of said fish in Hempstead harbor or bay, and at or near the mouth of Glen Cove creek in said harbor or bay; I have aided in catching them there during the present fishing season of 1883; I consider the said harbor and bay to be one of the best of fishing grounds, for the said fish are usually plentiful and good there; I have never known of any fish caught there that were diseased or injured.

SUMNER BAILEY.

Subscribed and sworn to before me, this 20th day of October, 1883.

BENJ. H. REEVE,
Notary Public.

STATE OF NEW YORK, *County of Suffolk*, } *ss.:*

Capt. John W. Burns, being duly sworn, says:

I am captain of the fishing steamer "Montauk" hailing from Greenport, N. Y.; I am engaged with said steamer in the pursuit of fishing for menhaden or moss-bunkers, and have been engaged in said business for the fifteen years last past; I have aided in catching thousands of said fish in Hempstead harbor or bay, and have made good catches at or near the mouth of Glen Cove creek; I consider said harbor and bay

good fishing ground, and have always considered it so ; I have caught said fish in the aforesaid creek very near the Glen Cove Starch Manufactory ; I have never seen or heard of fish caught in the aforesaid creek, harbor or bay that differed from the fish caught in the other waters that I have fished, or that were diseased.

JOHN W. BURNS.

Subscribed and sworn to before me, this 20th day of October, 1883.

BENJ. H. REEVE,
Notary Public.

STATE OF NEW YORK, *County of Suffolk*, } *ss.* :

Capt. Hugh A. Burns of Greenport, N. Y., being duly sworn, says :

That he is the 2d captain of the double-gang fishing steamer "Montauk" and is engaged with said vessel in the pursuit of fishing for menhaden or moss-bunkers, and that he has been engaged in said business for several years last past ; that he has helped catch thousands of said fish at, near or in the mouth of Glen Cove creek, and in Glen Cove creek near the Glen Cove Starch Factory, and also in Hempstead harbor ; that the aforesaid harbor and creek is good fishing ground and has been good fishing ground for many years ; that among the thousands of fish that he has helped catch or others have caught there, he has never known of any that differed from the fish caught in other waters on the Long Island coast.

CAPT. HUGH A. BURNS.

Subscribed and sworn to before me, this 20th day of October, 1883.

BENJ. H. REEVE,
Notary Public.

STATE OF NEW YORK, *County of Suffolk*, } *ss.* :

Capt. Joseph W. French, being duly sworn, says :

I reside at Bristol, Maine ; I am the captain of the fishing steamer "J. C. Tuthill," hailing from the port of Greenport, N. Y. ; I am engaged with said vessel or steamer, and in the business of fishing for menhaden or moss-bunkers ; I have been engaged in said business for the past twenty years ; during said time I have fished on all the principal fishing grounds for said fish from the coast of Maine to Sandy Hook, and in all the principal harbors and bays along the coast of Long Island ; I have often caught them in abundant quantities and good fish too in Hempstead harbor or bay ; during the season of 1882, I caught many thousands in said harbor or bay ; one night, by moonlight, near the mouth of Glen Cove creek, in said bay, during the month of August, 1882, I made a very large catch at one set of my net, and while I lost thousands of them, it being in the night-time, I saved over one hundred

thousand of said fish ; the said harbor or bay I consider one of the best of fishing grounds up the Long Island sound ; I have never heard of or seen fish caught in said bay or harbor, or near the mouth of said creek, that were or appeared to be injured or diseased, or different from the fish caught in any of the waters from Maine to Sandy Hook.

CAPT. JOSEPH W. FRENCH.

Subscribed and sworn to before me, this 20th day of October, 1883.

BENJ. H. REEVE,
Notary Public, in and for Suffolk County, N. Y.

STATE OF NEW YORK, *County of Suffolk,* } *ss.:*

Capt. George H. Rowland, being duly sworn, says :

I reside at Greenport, in the county and State aforesaid, and am the captain of the fishing steamer "Lizzie Wyman ;" I am engaged in the business of fishing for menhaden or moss-bunkers, and have been engaged in said business for the past eight years or more ; in the course of my business I have caught such fish in almost every bay and harbor along Long Island's coast; during the fishing season of 1882, I caught thousands of such fish in Hempstead bay and harbor, and found them very abundant there; I have also caught a good number of fish there during the present season of 1883 ; during the season of 1882, I caught many of them at or near the mouth of Glen Cove creek in said bay or harbor; I consider Hempstead bay or harbor to be one of the best of fishing grounds, and know that some of the fishing vessels fish in said bay or harbor and around the mouth of aforesaid creek continuously ; I have never seen or heard of fish caught there that were diseased or injured in any possible way or that differed from the menhaden caught in other waters.

CAPT. GEORGE H. ROWLAND.

Subscribed and sworn to before me, this 15th day of October, 1883.

BENJAMIN H. REEVE,
Notary Public, Suffolk County, N. Y.

STATE OF NEW YORK, *County of Suffolk,* } *ss.:*

George F. Tuthill and Thomas F. Price, of Greenport, in the county of Suffolk and State of New York, being duly sworn, each for himself says that they have been engaged in the fishing business or fishing for moss-bunkers or menhaden for about twenty years, and are now the superintendents of the Falcon Oil Company and the Ranger Oil Company, respectively ; that in the course of our business, we have received fish that were caught in almost every bay or harbor on Long Island's coast, and have often received them that were caught in Hempstead harbor ; that we have never known or heard of fish caught there near

the mouth of Glen Cove creek that were, or appeared to be in any way affected or injured in any manner; that so far as we know, they are as plentiful and abundant near the mouth of Glen Cove creek, in Hempstead bay or harbor, as in any other bay or harbor of its size on the coast of Long Island.

GEORGE F. TUTHILL,
THOMAS F. PRICE.

Subscribed and sworn to before me, this 13th day of October, 1883.

BENJAMIN H. REEVE,
Notary Public in and for Suffolk County, N. Y.

STATE OF NEW YORK, *County of Queens*, } *ss.:*

Philip G. Schwrar, of legal age, being first duly sworn, deposes and says:

That he resides in the city of New York; that from about June 20 until September 10, 1883, he was the clerk in charge at the hotel known as the Sea Cliff House, situated in the village of Sea Cliff, Long Island, in said county of Queens; that during the period of time above-named said hotel was open for the reception of guests, having accommodations for about two hundred persons; that during said period at least six hundred separate guests were at various times registered and accommodated, about one hundred and sixty guests being permanent boarders; that said Sea Cliff House is centrally located in said village of Sea Cliff, and is situated about one-eighth of a mile from the shore of Hempstead harbor and bay, and about one-half mile from the mouth of Glen Cove creek, where it empties into said bay, and less than one and one-half miles from the buildings and works of the Glen Cove Manufacturing Company, commonly known as the Glen Cove Starch Works; this affiant further states, that in his capacity as clerk of said Sea Cliff House, he was brought into constant contact with the guests thereof, and was the person to whom said guests were accustomed to come and make complaint; that this affiant at various times conversed and associated with the guests of said hotel, and heard them conversing among themselves; this affiant further states that during the time he was clerk as aforesaid and in constant communication with said guests, he never heard any of them complain about or express any dissatisfaction with any odors or smells arising or emanating from said Glen Cove Starch Works, or from Glen Cove creek, or from the flats or salt meadows lying between said starch works and Hempstead bay; that this affiant believes that if any odors or smells of a disagreeable, unpleasant or unhealthful nature had emanated or issued from said starch works, said flats or salt marsh, or from said creek, or from the waters of said bay, this affiant would have been informed about it by complaints from some of said guests, or would have heard the matter discussed by them; that this affiant himself never experienced or discovered any disagreeable, unpleasant or unwholesome odors or smells coming from the direction of or emanating from said starch works, or said creek, or said flats; that during the whole time above-mentioned the general health of the guests

of said hotel was excellent; this affiant further states that it was customary for the guests of said hotel to bathe in the waters of Hempstead bay within a distance of one-half mile from the point where said Glen Cove creek empties into said bay, but this affiant never heard any complaints or expressions of dissatisfaction on account of the water being polluted or in any manner rendered disagreeable or unpleasant by reason of discharges from said Glen Cove creek, or from said starch works or salt marshes; this affiant further states that when the petition complaining of the supposed odors arising from and the damage caused by said starch works was presented to him for his signature by one of the gentlemen circulating the same, this affiant refused to sign the same, at the same time stating that he had no complaints to make, that he heard no complaints, and did not believe that the charges contained in said petition were well founded; that finally after being repeatedly importuned and always refusing to sign, one of the persons interested in circulating said petition stated to this affiant that the petition to his Excellency, the Governor, was not intended to be in any manner inimical or damaging to the Messrs. Duryea or to the Glen Cove Manufacturing Company, but on the contrary, the Messrs. Duryea expressly desired and requested that persons should sign said petition; that relying upon said representations this affiant signed said petition; that subsequently discovering that he had been induced to sign said petition under a misapprehension, this affiant requested that his name should be erased from said petition, but whether his name has been erased or not this affiant is ignorant; this affiant further states that he has no personal or property interests either in the village of Sea Cliff or in the village of Glen Cove, or in the Glen Cove Manufacturing Company, that he is an entirely disinterested party.

P. G. SCHWRAR.

STATE OF NEW YORK, } *ss.:*
County of Queens, }

P. G. Schwrar, being duly sworn, says the foregoing statements to which he has subscribed his name are true in each and every particular.

J. MERWIN OLDRIN,
Notary Public, Queens County, N. Y.

SEA CLIFF, *October* 16, 1883.

STATE OF NEW YORK, } *ss.:*
County of Queens, }

George Gardner, being duly sworn, deposes and says that he is a resident and trustee of the village of Sea Cliff, Long Island, in said county of Queens, and is the owner and proprietor of Gardner's Hotel; that during the season and summer of 1883, said hotel was open and filled with guests at all times, having rooms and accommodations for about seventy persons; that said hotel is situated on the shore of Hempstead bay not more than fifty feet from the water and not more than one-half mile from the mouth of Glen Cove creek, and is also centrally located in the village of Sea Cliff; that with the exception of

one person, who on one occasion complained of a disagreeable odor, no complaints were made or fault found by any of the permanent or transient guests of said hotel during said summer season of 1883, on account of any odors or smells or disagreeable or unwholesome effects emanating from or caused by the Glen Cove Starch Works, or the waters of Glen Cove creek or Hempstead bay, or the mud flats lying near the mouth of said creek; that at long and infrequent intervals, when the atmosphere is sultry and the wind blows from the direction of said mud flats or salt marshes lying between said hotel and said starch works, a peculiar odor is experienced, but never of such a nature as to be unwholesome; that this affiant does not believe that said starch works or the discharges therefrom are a nuisance, or that they, or the discharges from them, injure or kill either fish, oysters or clams; that this affiant expresses such belief after an experience of nine seasons at Sea Cliff as a resident; that by far the largest bath-houses, at which nearly if not quite one-half of the persons who bathe on the shores of Sea Cliff assemble and are accommodated, is located directly in front of this affiant's hotel, and this affiant has never heard any complaints from any of said bathers on account of any supposed pollution of the water by reason of any discharges from said starch works, nor, so far as he knows, have bathers suffered any inconvenience or discomfort on account of the water being impure; that the guests, at this affiant's hotel and at what is known as the Sea Cliff House, during the summer season comprise a large part of the population of said village of Sea Cliff; and as indicating that said village is not a disagreeable or unwholesome place to dwell, this affiant states that both of said hotels are usually full of guests during the whole summer season; and that in the case of this affiant he could not accommodate a very considerable number of persons who at various times applied for rooms at his hotel during the past season; and that at the close of the season many of the guests stopping at this affiant's hotel expressed a desire to return again next year, being pleased and invigorated by the pure and salubrious atmosphere.

GEO. GARDNER.

Sworn to before me, this 17th day of , 1883.

HENRY E. GOULD,
Notary Public, Queens County, N. Y.

STATE OF NEW YORK, *County of Queens,* } *ss.:*

Wm. Hind, being duly sworn, deposes and says that he resides at Sea Cliff in said county; that he is of the age of years, and has resided at Sea Cliff within one mile of the premises and works of the Glen Cove Manufacturing Company at that place for three years; that deponent is an engineer and is engaged in business at Sea Cliff and Glen Cove; that deponent is acquainted with the external operations of said company at Glen Cove, and has been so acquainted for three years last past, and is also acquainted with Glen Cove creek on which said company's manufactory is situated, and with Hempstead harbor into which the waters

of said creek flow; that the operations of said manufactory are not in any way prejudicial to the health or physical comfort of this deponent; that deponent is quite generally acquainted with the inhabitants of Glen Cove residing in and about the vicinity of said manufactory; that except by the complaint made to the State Board of Health by certain persons, deponent has never known or heard of any person being made sick or uncomfortable at Glen Cove or elsewhere from or by reason of the operations of said manufactory; that in the neighborhood of said manufactory there have from time to time occasionally arisen from said creek and the marshes and mud flats adjacent thereto certain disagreeable odors, and in the belief of deponent not from the result of the operations of said manufactory; which odors, from information derived from numerous old inhabitants of Glen Cove, he verily believes prevailed long before the establishment of said starch and glucose works; that during the residence of this deponent at Sea Cliff said odors have gradually diminished in their frequency and potency; that said odors in no respect interfere with the enjoyment of life, health or property; that the paint upon buildings in the neighborhood of said creek, or upon the boats used in the waters thereof, are affected in no way different from buildings and boats in or about the waters of other creeks and mud flats on Long Island; as to this deponent cannot say; that deponent has no pecuniary interest in said company, or its operations, except as an employee; deponent further says that he has during the three summers last past, kept a boarding-house at Sea Cliff (centrally located) for the accommodation of summer boarders; that he has had boarding with him during the season last past no less than seventy-five boarders; that he has never heard any complaints from his said boarders that said manufactory or its operations created any nuisance or in any way affected them unpleasantly.

WILLIAM HIND.

Sworn to before me, this 20th day of October, 1883.

E. T. PAYNE,
Notary Public, Queens County, N. Y.

Fifty-four affidavits of similar import.

[The original affidavit, of which the following is a copy, was handed to Dr. Harris, the Secretary of the State Board of Health, at the sitting of said Board in Glen Cove on the 29th day of September, 1883.]

STATE OF NEW YORK, *County of Queens,* } *ss.:*

William Cock, being duly sworn, says:

That he resides at Glen Cove in said county and has so resided for more than fifty years; that he is of the age of fifty-three years; that he has been engaged in the clam and oyster business in and about the waters of Hempstead harbor and the waters adjacent thereto for the past forty years; that he is now a member of the firm of Cock Brothers who are engaged in said business at Glen Cove, carrying on the same in the aforesaid waters; that said firm is composed of deponent and

his brothers Isaac and Stephen Cock; that he is well acquainted with the Glen Cove Manufacturing Company's manufactory at Glen Cove aforesaid, and also acquainted with the premises and creek on which the same is located, and with its external operations and with the waters of the creek on which said manufactory stands; that said firm of Cock Brothers own, occupy and work a large bed of oysters situated in the waters of Hempstead harbor about one-fourth of a mile from the mouth of Glen Cove creek where the waters of said creek empty into said harbor; that the waters of said creek, with each recurring tide (twice in every twenty-four hours), flow over said oyster bed; that said oyster bed was planted at said point and place twenty years ago; that the same has ever since been maintained and is now in as good and healthy condition as at any previous time; that the interest of said business has in no way been injured by any of the operations of said manufactory; that the oysters growing on said bed have never been destroyed or injured by the operations of said manufactory, or by the waters or ingredients or substances in the waters of said creek flowing over said oysters as aforesaid.

WILLIAM COCK.

Subscribed and sworn to before me, this 27th day of September, 1883.

E. T. PAYNE,
Notary Public, Queens Co., N. Y.

STATE OF NEW YORK, *County of Queens,* } *ss.:*

Joshua T. Wright, being duly sworn, says:

That he has resided at Glen Cove in said county within a mile of the premises and works of the Glen Cove Manufacturing Company at that place ever since they were established; I was born and have always lived at Glen Cove with the exception of two or three years; I am eighty years of age; I have been acquainted with Glen Cove creek and with the Glen Cove Starch Factory from the time said factory was erected, and was familiar with the creek as long ago as I can remember, seventy years or more; the operations of said manufactory are not in any way prejudicial to the health or physical comfort of deponent, and I have never known of any person being made sick or uncomfortable thereby; there have always arisen, at certain times, certain disagreeable odors from said creek; I remember them long before the factory was built; I am very fond of fishing and clamming and have caught fish and clams off the mouth of Glen Cove creek for over fifty years; I caught fish there a few days ago in a place where the water flows out of the creek; last year I caught clams at the mouth of the creek in excellent condition; I am engaged in farming and own the farm whereon I reside; I have no pecuniary interest in said company or its operations.

JOSHUA T. WRIGHT.

Sworn to before me, this 12th day of October, 1883.

E. T. PAYNE,
Notary Public, Queens Co., N. Y.

[The original affidavit, of which the following is a copy, was handed to Dr. Harris, Secretary of the State Board of Health, at the sitting of the Board in Glen Cove on the 29th of September, 1883.]

STATE OF NEW YORK, }
County of Queens, } *ss.:*

William Cock, Isaac Cock, Stephen Cock, Julius Webster and Horatio Losee, being severally duly sworn, depose and say:

That they reside at or near Glen Cove in said Queens county; that they now are and for many years last past have been engaged in the clam and oyster business in and about the waters of Hempstead harbor, and at and near the mouth of Glen Cove creek where the waters of said creek empty into said Hempstead harbor; that deponents are well acquainted with the Glen Cove Manufacturing Company, a corporation engaged in the manufacture of starch and glucose, having its manufactory at Glen Cove on the aforesaid creek; that deponents are and for about twenty years have been acquainted with the works and external operations in and about the premises and manufactory of said company at said Glen Cove; that to the best knowledge and belief of deponents there is nothing in the operations of said manufactory or connected therewith prejudicial to their said business or detrimental to its interests, or destructive of the oysters and clams grown and found in the waters of said harbor, or injurious to the health and growth of the clams and oysters now growing in said waters.

WILLIAM COCK,
ISAAC COCK,
STEPHEN COCK,
JULIUS WEBSTER,
HORATIO LOSEE.

Sworn to before me, this 27th }
day of September, 1883. }
E. T. PAYNE,
Notary Public, Queens Co., N. Y.

STATE OF NEW YORK, }
County of Queens, } *ss.:*

William B. Robinson, being duly sworn, deposes and says:

That he resides at Glen Cove in said county; that he is forty-three years of age, and has resided at said Glen Cove within one-fourth of a mile of the premises and works of the Glen Cove Manufacturing Company at that place for sixteen years; that deponent is acquainted with the external operations of said company at Glen Cove, and has been so acquainted for sixteen years last past, and is also acquainted with the Glen Cove creek on which said company's manufactory is situated, and with Hempstead harbor into which the waters of said creek flow; that the operations of said manufactory are not in any way prejudicial to the health or physical comfort of this deponent; that deponent is quite generally acquainted with the inhabitants of Glen Cove residing in and about the vicinity of said manufactory; that deponent has never known of any person being made sick at Glen Cove or elsewhere from or by reason of the operations of said manufactory; that in the neighborhood of said manufactory there have from time to time occasionally arisen

from said creek and the marshes and mud flats adjacent thereto certain disagreeable odors, which odors, from information derived from many of the old inhabitants of Glen Cove, he believes prevailed long before the establishment of said starch and glucose works; that during the residence of this deponent at Glen Cove said odors have gradually diminished in their frequency and potency; that said odors in no respect interfere with the enjoyment of life, health or property.

WILLIAM B. ROBINSON.

Sworn to before me, this 12th day of October, 1883.

E. T. PAYNE,
Notary Public, Queens County, N. Y.

STATE OF NEW YORK, *County of Queens,* } *ss.:*

John Dowling, Nicholas Sheridan, Michael Mackin, James Lamb, Joseph Bowers, Thomas Murphy, Hugh Flaherty, being severally duly sworn, each for himself deposes and says:

That he has resided in Glen Cove in said county for fifteen years last past within one-half a mile of the Glen Cove Starch Manufactory; that he is the owner of real property in said Glen Cove; that he has worked in and about said manufactory for many years; that deponent is acquainted with the operations of said company at Glen Cove, and has been so acquainted for fifteen years last past, and is also acquainted with Glen Cove creek on which said company's manufactory is situated, and with Hempstead harbor into which the waters of said creek flow; that the operations of said manufactory are not in any way prejudicial to the health and physical comfort of this deponent; that deponent is quite generally acquainted with the inhabitants of Glen Cove residing in and about the vicinity of said manufactory; that deponent has never known or heard of any person being made sick or uncomfortable at Glen Cove or elsewhere from or by reason of the operations of said manufactory; that in the neighborhood of said manufactory there have from time to time occasionally arisen from said creek and the marshes and mud flats adjacent thereto certain disagreeable odors, and in the belief of deponent not from the result of the operations of said manufactory, which odors, from information derived from numerous old inhabitants of Glen Cove, he verily believes prevailed long before the establishment of said starch and glucose works; that during the residence of this deponent at Glen Cove said odors have gradually diminished in their frequency and potency; that said odors in no respect interfere with the enjoyment of life, health or property.

JOHN DOWLING,
NICHOLAS I. SHERIDAN,
MICHAEL MACKIN,
JAMES LAMB,
JOSEPH BOWERS,
THOMAS MURPHY,
HUGH FLAHERTY.

Sworn to before me, this 13th day of October, 1883.

E. T. PAYNE,
Notary Public, Queens County, N. Y.

STATE OF NEW YORK,
City and County of New York, } *ss.:*

George H. Creed, being duly sworn, says:

I reside at Jamaica in Queens county, and am engaged in business at No. 103 Reade street in said city; I am familiar with Jamaica bay on the south side of Long Island and with its surroundings; at low tide mud flats are exposed at the head and about the borders of said bay, which frequently exhale a sour, pungent, musty and very disagreeable odor; these mud flats also exhale what are commonly termed gases — the effect of which is to turn the color of paint on boats and vessels in the waters of said bay; I have observed the color of boats to be turned almost black in the course of one night from this cause; these gases will form a dirty black coating on boats and vessels and even on the sails of vessels; silver also will be turned a dark color in the vicinity of said bay as I know from frequent observation; one day last summer I took a freshly-painted yacht down to Jamaica bay and put her in my boat-house; the following morning her deck was covered with this black coating; it is very difficult to remove this coating from any thing upon which it settles; two years ago I gave my son a boat, which he keeps in said bay; she gets constantly coated with these mud gases, and he finds it impossible to keep her clean, although he has worked faithfully to do so; there are no manufactories situated upon Jamaica bay or on any creek or stream running into the same; there are some — but not starch or glucose — upon Barren island, which is located just outside of Jamaica bay and fully four miles distant from that part of said bay where I have seen paint and silver turned as aforesaid; I have no interest, directly or indirectly, in the Glen Cove Manufacturing Company or its operations.

G. H. CREED.

Sworn to before me, this 24th day of October, 1883.

E. T. PAYNE,
Notary Public, Queens County, N. Y.

Certificate filed in New York county clerk's office.

STATE OF NEW YORK,
County of Queens, } *ss.:*

Oakley Ketcham, being duly sworn, says:

That he resides at Glen Cove in said county, in full view of, and about three or four hundred yards distant from the Glen Cove Starch Manufactory, in a northerly direction, and has occupied his present residence for fourteen years last past; that deponent came to Glen Cove to reside in or about the year 1838, and has resided there ever since with the exception of about ten years; that during all the period of his residence in Glen Cove, since the establishment of said manufactory (which was in or about the year 1855), deponent has resided within a quarter of a mile of said manufactory; that during the early years of deponent's residence in Glen Cove, and prior to 1855, he was in poorer health than at any time since; that he is now sixty years of age and has been in the enjoyment of excellent health for twenty years last past;

that deponent is familiar with the external operations of said manufactory and with Glen Cove creek, at the head of which it is located as well as with the surroundings; that on either side of said creek, principally on the southerly side, there are extensive salt marshes or mud-flats which are owned by different persons residing in and about Glen Cove; the mud on these flats is in many places knee-deep, and, at low tide, they are bare and fully exposed; and when so exposed, and there happened to be a warm, heavy, humid or foggy atmosphere, there arises from them a disagreeable odor which, I am persuaded, is the cause of complaint of the Sea Cliff people; this odor would exist independent of said manufactory; I have observed similar odors from other mud-flats where there was no such manufactory, and I am of the opinion that the same would not be avoided by the removal or closing of said manufactory; I own considerable real property at Glen Cove and Sea Cliff, and am engaged in business in the manufacture and sale of slate; I have no pecuniary interest in said Glen Cove Manufacturing Company.

OAKLEY KETCHAM.

Sworn to before me, this 16th day of October, 1883.

E. T. PAYNE,
Notary Public, Queens County, N. Y.

STATE OF NEW YORK, *County of Queens,* } *ss.:*

Walter Smith, being duly sworn, says:

I am an engineer and sometimes act as newspaper reporter, and reside at Jamaica in said county; I am familiar with Jamaica bay on the south side of Long Island; there are no manufactories on or about said bay, except at what is called the Inlet, which is a point some four or five miles distant from that part of Jamaica bay to which I hereinafter refer; and the manufactories which are at said Inlet are neither starch or glucose manufactories; I attended the sitting of the State Board of Health held at Glen Cove, in said county, on the 29th of September last, to inquire concerning certain complaints made by residents of Sea Cliff against the Glen Cove Manufacturing Company; and there heard certain residents of Sea Cliff describe how paint and silver was affected in and about Glen Cove creek; I have often known paint and silver to be affected in the same manner in and about Jamaica bay — caused by what are commonly termed mud gases; I have seen the color of boats so changed by these gases within twenty-four hours that they looked as though they had received a coat of black paint; it is quite difficult to remove from paint the coating caused by these mud gases; I have no interest, directly or indirectly, in the Glen Cove Manufacturing Company or its operations.

WALTER M. SMITH.

Sworn to before me, this 18th day of October, 1883.

E. T. PAYNE,
Notary Public, Queens County, N. Y.

STATE OF NEW YORK, } ss.:
County of Queens, }

John H. Sutphin, being duly sworn, says:

I am the clerk of the county of Queens, and reside at Jamaica, in said county; I am familiar with Jamaica bay on the south side of Long Island; at low tide there are numerous mud flats exposed at the head and about the borders of said bay; there arises from the mud flats what are commonly termed mud gases; I have known the paint on vessels in said bay to be turned almost black in the course of twenty-four hours by these gases; I built a boat-house on the margin of said bay about three years ago, and in a short time almost every thing in it was turned a dark steel color; even the oil-cloth on the floor was so turned; there are odors which arise from these mud flats which affect some persons very unpleasantly; there are no manufactories within four miles of the places where I have seen and observed the aforesaid effects of said mud gases; I have no interest, directly or indirectly, in the Glen Cove Manufacturing Company or its operations.

J. H. SUTPHIN.

Sworn to before me, this 18th day of October, 1883.

E. T. PAYNE,
Notary Public, Queens County, N. Y.

STATE OF NEW YORK, } ss.:
County of Queens, }

Phebe A. Yarrington, being duly sworn, deposes and says:

That she resides at Glen Cove, in said county; that she is of the age of fifty-six years, and has resided at said Glen Cove and within one mile of the premises and works of the Glen Cove Manufacturing Company at that place, for twenty-one years; that deponent owns real estate in Glen Cove and is engaged in farming; that deponent is acquainted with the external operation of said company at Glen Cove, and has been so acquainted for twenty-one years last past, and is also acquainted with Glen Cove creek on which said company's manufactory is situated, and with Hempstead harbor into which the waters of said creek flow; that the operations of said manufactory are not in any way prejudicial to the health or physical comfort of this deponent; that deponent is quite generally acquainted with the inhabitants of Glen Cove residing in and about the vicinity of said manufactory; that deponent has never known or heard of any person being made sick or uncomfortable at Glen Cove or elsewhere from or by reason of the operations of said manufactory; that in the neighborhood of said manufactory there have from time to time occasionally arisen from said creek and the marshes and mud flats adjacent thereto certain disagreeable odors, and in the belief of deponent not from the result of the operations of said manufactory; that said creek and adjacent marshes and mud flats have within the recollection of deponent emitted such odors for a period of more than forty years, and to the knowledge of deponent at least twelve years before the establishment of said manufactory; that since the establishment of said manufactory, for the manufacture of starch and glucose,

said odors have, to the knowledge of deponent, become materially less, and gradually less frequent and less disagreeable; so much so as not to interfere with the enjoyment of health, comfort or property; that the paint upon buildings in the neighborhood of said creek, or upon the boats used in the waters thereof, are affected in no way different from buildings and boats in or about the waters of other creeks and mud flats on Long Island; that deponent has no pecuniary interest in said company or its operations; that deponent came to Glen Cove when she was about twelve years of age, and has resided there off and on the greater portion of her life; last Saturday, on crossing Jamaica bay on the south side of Long Island, I experienced odors from the flats in Jamaica bay and they were very disagreeable, as bad as any that ever came from Glen Cove creek; I know of no manufactory on Jamaica bay.

PHEBE A. YARRINGTON.

Sworn to before me, this 12th day of October, 1883.

E. T. PAYNE,
Notary Public, Queens County, N. Y.

In the matter of the complaints of certain persons to the State Board of Health against the Glen Cove Manufacturing Company.

To the Honorable State Board of Health of the State of New York:

GENTLEMEN—We herewith hand you the affidavits of no less than one hundred and sixty persons, which contain a most emphatic and complete refutation of the charges made against this company by the complainants. The citizens in and about Glen Cove feel keenly the wrong and injury done them and this company by the groundless charges of the complainants, and have been ready in offering to make their affidavits concerning the truth of the matters in question. We have only been limited in taking the number of such affidavits by our desire not to impose upon you the onerous duty of perusing a vast body of papers which would be cumulative. In taking the affidavits presented to you we have kept in view three points which we believe will meet your approbation and have their proper weight in your considerations. They are,

First. The disinterestedness of the affiants in this company or its operations.

Second. The proximity of the affiants' residence to the premises and works of this company and the length of such residence.

Third. The standing of the affiants in the community as property-holders.

We deem it judicious to call your attention to these points that your minds may be drawn to a comparison with the evidence furnished by the complainants, for we have it on credible authority that the great bulk of affidavits which they have procured to present to you in this matter are the affidavits of persons who have no residence in the vicinity of Glen Cove or Sea Cliff nor a dollar's worth of property interest; but are largely of persons from the cities who may have temporarily stopped at Sea Cliff and having observed either the odors from the local nui-

sance near the Sea Cliff Hotel mentioned in the certificate of your local board of health, which is also herewith handed you, or the odors from the mud flats of Glen Cove creek, erroneously attributed such odors to the operations of this company. You will readily perceive how easily the most positive affidavits may be procured from such persons and how little weight should be given to them in comparison with those of persons who have resided many years in close proximity to our works and to Glen Cove creek.

In the package marked A are the affidavits of seventy-five persons, forty-five of whom have resided in close proximity to Glen Cove creek, for periods ranging from thirty to eighty-six years, and who remember for periods of from two to fifty years before the erection of this company's works, the same disagreeable odors which now occasionally prevail; the names which you will find upon these affidavits may not be all wholly unknown to you, as among them are those of many of Glen Cove's oldest, best and most influential citizens, and some whose spheres of usefulness have not been altogether confined to their native place. For your more ready reference it has been thought best to classify and subdivide the affidavits in this package, in order that your minds may be more forcibly drawn to certain points material to the questions in controversy.

In the envelope marked No. 1 you will find the affidavits of thirty-three persons who give evidence of the existence of the odors complained of, for years before the erection of this company's manufactory. Many of these persons speak of said odors with great particularity, one old lady aged eighty years, the sister of a greatly esteemed physician of this place, the late Dr. Thomas Garvis, has resided on the same farm and within one hundred yards of Glen Cove creek for upward of seventy-two years — the doctor's daughter and grand-daughter, the latter aged thirty-five years, have also resided all their lives on the same farm — you will find their affidavits among those presented to you.

In the envelope marked No. 2 you will find affidavits of a similar character to those in No. 1, with the additional fact that the affiants reside either between this company's manufactory and the residence of Mr. S. L. M. Barlow, one of the complainants, or upon the same premises with him; these people are nearly all property holders and their affidavits are entitled to much weight.

In the envelope marked No. 3 you will find the affidavits of no less than nine persons, engaged in keeping boarding-houses and hotels at Glen Cove and Sea Cliff; and we may add that they keep the best and most popular houses those places can boast of.

In the envelope marked No. 4 will be found the affidavits of eight persons, baymen and farmers, who catch fish, oysters and clams at the mouth of Glen Cove creek, and have done so for periods running back fifty years.

In the envelope marked No. 5 you will find the affidavits of persons, vessel captains and others, who are and have for many years been accustomed to sleep on their vessels while lying in Glen Cove creek; weighty evidence on the question of health.

In the envelope marked No. 6 are the affidavits of persons residing at Glen Cove, and elsewhere, which show that the same disagreeable odors complained of arise from mud flats in other places where there are no

manufactories, and that paint and silver are discolored by mud-gases in the same manner as described by the complainants ; in this connection, let us call your attention to the affidavit of your Glen Cove host Snediker, contained in the envelope marked No. 3.

In the envelope marked No. 7 are the affidavits of Messrs. John and E. E. Duryea, to the effect that no acids are discharged or allowed to escape into Glen Cove creek.

Envelope No. 8 contains the certificate of our local board of health in reference to certain nuisances which existed at Sea Cliff last summer.

In the package marked B are the affidavits of fifty-four persons who have resided in the vicinity of this company's works, for periods of from two to twenty-eight years, and who corroborate the older residents as to the healthfulness of the place and its freedom from any discomfort caused by the operations of this company ; among these names will be found those of nearly all the merchants of Glen Cove ; a pointed indication of the fact that they have been drawn to and have engaged in business here by reason of the development of the place by the operations of this company. You will also find in this package the affidavits of some persons who are, and for many years have been, employed in this company's manufactory, and who represent all its various departments ; these affidavits were included that you might be assured of the absolute healthfulness of this company's operations.

In the package marked C will be found the affidavits of thirty-one fishermen residing in other places, showing the character of Hempstead harbor as a fishing ground, and as compared with other bays and harbors on the coast of Long Island. These affidavits must to all reasonable minds be conclusive proof of the fact which we have always asserted, that nothing poisonous or deleterious is allowed to escape from our premises into the waters of Glen Cove creek or Hempstead harbor. We beg to call your attention to the fact, that at the sitting of your honorable Board in Glen Cove, on the 29th day of September last, we handed you a paper signed by all the five physicians of this place, wherein they certified to the healthfulness of this place and of this company's operations ; and in conclusion we respectfully ask that if your honorable Board shall think it necessary or desirable to have any other or further evidence on our part, touching the questions in issue, that you will, before finally closing or deciding those questions, afford us an opportunity to put in such evidence.

Respectfully submitted,

WRIGHT DURYEA,

President Glen Cove Manufacturing Company.

Dated GLEN COVE, L. I., *October* 29, 1883.

In the matter of the petition of certain residents of Sea Cliff against the Glen Cove Manufacturing Company.

STATE OF NEW YORK, }
City and County of New York, } *ss.:*

Simon D. Phelps, being duly sworn, deposes and says that he is a resident of the city of New York, and that he spent a portion of the

summer seasons of the years 1882 and 1883 in and about Glen Cove and Sea Cliff, Long Island; that he is well acquainted with the neighborhood and knows many of the people in it, and is conversant by personal observation and investigation with the matters involved in the petition and complaint of certain residents of Sea Cliff against the Glen Cove Manufacturing Company; this affiant states that he has never suffered any inconvenience or discomfort by reason of any disagreeable odors, smells or exhalations emanating from the Glen Cove Starch or Glucose Works, nor has he ever, while in or about Glen Cove or Sea Cliff, experienced any unwholesome effects caused by said works; that before and since the time of the filing of said petition, this affiant has conversed with a large number of the residents of Glen Cove and Sea Cliff relative to the charges contained therein, and with the exception of comparatively a few interested persons, he has heard no complaints or expressions of dissatisfaction on account of any unpleasant or disagreeable odors or smells suffered by them, and that in the case of those making complaints, they have stated that only at long and infrequent intervals have they experienced any odors or smells, and then only for short periods of time; this affiant further states that there are situated between said starch and glucose works and the village of Sea Cliff, extensive mud flats and salt marshes through which flows Glen Cove creek in the same channel through which it has flown for more than a century; that a portion of the waters of said creek flowing from above tide-water are used by the Glen Cove Manufacturing Company for the necessary purposes of their business, and after such use are discharged into said creek, but such discharges contain no acids, or deleterious or offensive fluids or substances whatever; that twice every twenty-four hours said mud flats and salt marshes are overflowed by the salt water from Hempstead bay, the tide also penetrating said creek up to the works and factories of said company, said creek at high tide being navigable for vessels drawing at least five feet of water; that at infrequent intervals (and sometimes not for several months) when the wind blows from a certain direction and the atmosphere is warm and sultry, and when said mud flats and salt marshes are laid bare by the receding tide, an odor or smell arises from them which is perceptible at Sea Cliff, but such odor or smell never continues for more than a short time and is the same in its nature that this affiant has usually found in other places near mud flats or salt marshes over which the tide flows and which are left at times uncovered; this affiant further states that he has lived for many years near the Atlantic ocean, and knows from experience the peculiar conditions and effects which are produced at times by mud flats or salt marshes being laid bare at low tide, one of which effects of frequent occurrence is the discoloration or damage to paint upon buildings and boats situated and lying near such exposed mud flats or marshes; that at Sea Cliff there are no more than two or three buildings upon which the paint has been in any manner discolored or damaged, but whether such discoloration or damage was owing to the gases arising from said mud flats or salt marshes, or to the inferior quality of paint used this affiant is unable to state, but from the fact that the paint upon nearly all the buildings in Sea Cliff is not discolored and remains unaffected, this affiant believes that to the poor quality of paint used is due whatever discoloration is apparent; this affiant also states that he has seen

boats upon the shores adjacent to Sea Cliff upon which the paint was discolored or upon which there was but little paint to be seen; that such boats had either not been recently painted, or if they had, proper care had not been exercised in caring for them so as to preserve the paint; that it is customary at Sea Cliff to leave boats so that at low tide they are high and dry upon the shore or in the mud exposed to the heat of the sun, when the paint is liable to damage; that in all cases at Sea Cliff where proper care has been exercised (and such care as is usually taken by boatmen in other places) in anchoring or fastening boats so that they should at all times be and remain afloat, instead of lying upon the bare ground, no damage to paint has resulted so far as this affiant has been able to learn; this affiant further states that he, together with large numbers of other people, has frequently fished in the waters adjacent to Sea Cliff during the past season, the chosen and usual place for fishing being less than one-half mile from the mouth of said Glen Cove creek where it empties into Hempstead bay, and that when so fishing he as well as others has had better success than is usual in other waters near New York commonly frequented by fishermen; that during the past season as in previous years several vessels with boats and nets have constantly frequented the waters of Hempstead bay adjacent to Sea Cliff and near the mouth of said creek for the purpose of taking menhaden, with the result as stated to this affiant by those in charge of said vessels that they have had extraordinary large catches of fish, and were uniformly more successful than those plying a similar calling on other fishing grounds; this affiant further states that Hempstead bay is a favorite ground for taking oysters and clams in quantity and of a quality seldom equaled; that uniformly the seasons are good for this business and profitable, but as in other places from various causes the season is bad occasionally; that the present season has been more than usually favorable for oysters and clams in Hempstead bay, and this affiant has seen large quantities of oysters and clams taken within the past month within less than one-half mile from the mouth of Glen Cove creek, equal in size and flavor to any that can be found in the New York market; that recently this affiant has seen large quantities of oysters dredged from near the mouth of said creek the shells of which were literally covered with young oysters or "setts" in a flourishing and healthy condition; that where oysters will propagate and grow in this manner, the water and bottom must be exceptionally well adapted to them, and this affiant knows from his experience that water which will enable young oysters to grow and flourish will certainty not kill or injure larger and older oysters; that in several instances where owners of oyster beds in Hempstead bay during past seasons have found their oysters dead or injured, that the cause has been either the planting of young oysters when dead,or planting them in such shallow water that they were killed by thick beds of ice settling upon, and in no case has such destruction or injury arisen on account of the waters of Glen Cove creek having polluted the waters of Hempstead bay; this affiant further states that he has seen large numbers of people bathing on the beach adjoining Sea Cliff, and has conversed with many others who have often bathed there during the past season, and in no instance has he heard any complaints from those accustomed to bathe on the flood or at high tide, which is the proper and usual time selected at other seaside resorts for

bathing; that he has heard a few persons who bathed at low tide complain of the debris or foreign matters floating upon the surface of the water, but whether such offensive matter was brought in and left by the flood tide or not they could not state; that many of the bathing-houses at Sea Cliff are located near said mud flats or salt marshes, and only from bathers in this locality has this affiant heard any complaints, those bathing a few hundred feet further up the shore where the largest bathing-houses are located never having experienced any inconvenience.

SIMON D. PHELPS.

Sworn to before me, this 5th day of November, 1883.

JAMES H. ROBERTSON,
Notary Public (20), *New York City and County.*

To whom it may concern:

The board of health of the town of Oyster Bay, Queens county, New York, being requested, by a written communication from a citizen of the town aforesaid, dated October 1, 1883, to furnish said correspondent all official facts touching the sanitary condition of the village of Sea Cliff in said town of Oyster Bay during the summer last past, do hereby certify that on or about the 6th day of August, 1883, a complaint was made to said board of health that a nuisance existed at the Sea Cliff Hotel, at Sea Cliff, and also at the Bay View House, at the same place.

In response to said complaint the board of health appointed Samuel Frost, secretary of said board, and D. B. Whitney, health officer, a committee to examine the aforesaid complaints.

August 7, 1883, the committee visited Sea Cliff and examined the premises complained of; found the rear of the kitchen apartment of the Sea Cliff Hotel in a very offensive and unsanitary condition, the ground in places strewn with shells, garbage and decomposing vegetables, with several barrels filled with table fragment and kitchen refuse in a decomposing condition through the negligence of the officer of this department of the hotel, and to the very worthy proprietress entirely unknown. The order to abate the nuisance and place the premises in a good sanitary condition within twenty-four hours promptly executed.

The Bay View House was examined and found in an unsanitary and very offensive condition, the water-closets very much neglected, the drain-pipe, or sewer from the kitchen, on the west and rear of said house, running down the declivity toward the shore of the bay or harbor, had become obstructed and overflowing so as to run into the premises of the next house some feet distant.

An order to abate said nuisance and place the premises in a good sanitary condition within thirty-six hours was issued, and by the subsequent examination of Secretary Frost found to have been promptly fulfilled.

JOHN CASHOW, *President.*
SAMUEL FROST, *Secretary.*
D. B. WHITNEY, *Health Officer,* } *Committee.*

State of New York, } ss.:
County of Queens, }

Edgar E. Duryea, being duly sworn, deposes and says:

That he resides at Glen Cove in said county, within two hundred yards of the manufactory premises and works of the Glen Cove Manufacturing Company at that place; that deponent is the superintendent of the chemical department of said company in its said manufactory, and all the chemicals used or employed therein are under his direct and personal supervision; that deponent is thoroughly conversant with all the processes and operations of said company in the manufacture of starch and glucose, and has been so conversant for upwards of twenty-six years; that there is not now and during all that time never has been discharged or allowed to escape from said manufactory, premises and works into Glen Cove creek any acids of any description.

E. E. DURYEA.

Sworn to before me, this 22d day of October, 1883. }

E. T. Payne,
Notary Public, Queens County, N. Y.

State of New York, } ss.:
County of Queens, }

John Duryea, being duly sworn, deposes and says:

That he resides at Glen Cove in said county, and within one hundred yards of the manufactory premises and works of the Glen Cove Manufacturing Company at that place; that deponent is the general superintendent of said manufactory premises and works, and thoroughly conversant with all the processes and operations of said company in the manufacture of starch, glucose and other products; that he has been superintendent and so conversant for upwards of twenty-six years; that there is not now and, during all that time, never has been discharged or allowed to escape from said manufactory premises and works, acids of any description into Glen Cove creek.

JOHN DURYEA.

Sworn to before me, this 22d day of October, 1883. }

E. T. Payne,
Notary Public, Queens County, N. Y.

REPORT.

To the State Board of Health:

On the 19th of September last a complaint was made by numerous persons residing at or near Sea Cliff — a summer resort on Hempstead bay — to the Governor of the State of New York, praying for relief against an alleged nuisance injurious to comfort and health, caused by the proceedings of the Glen Cove Manufacturing Company, located at Glen Cove on the west end of the bay, which nuisance consists of the discharge into the waters of the bay the waste material of the manufactory, causing nauseous stenches, contaminating the water and injuring the oyster fishery to a great extent, besides rendering the residents of Sea Cliff uncomfortable by reason of the odor emanating therefrom. This petition accompanied by affidavits was referred by the Governor to the State Board of Health, and by the Board to its committee on effluvium nuisances for examination and report.

In pursuance of the duty imposed upon it the committee would present the following as the result of its investigation :

On the 24th of September last a public hearing, duly advertised by postal notices, was held at Glen Cove, Health Commissioner Erastus Brooks presiding, for the purpose of taking testimony from the complainants and from those denying the existence of the nuisance complained of. The testimony given by the complainants was to the effect that during certain periods and under certain atmospheric conditions there prevailed vile and nauseous stench caused by the pollution of the waters referred to, and that bathing was impossible owing to the existence of decomposed vegetable matter in the water and along the shore, and that the oyster and clam fisheries were seriously damaged by the same causes.

Per contra, the manufacturers and others declared that no such nuisance existed ; that the odors referred to as emanating from the Glen Cove Manufacturing Company were due to the uncovering of the marshes at low tide, and generally denying the allegations of the complainants.

Your committee would state that those who *denied* the *existence* of the nuisance were chiefly the inhabitants of Glen Cove and those whose residences are located on the east side of the bay, while those who *asserted* its *existence* have their homes on the hill at Sea Cliff to the westward of the factory.

The employment was authorized of Messrs. Arthur Hollick, Ph. B., C. E. Munsell, Ph. B., Professor Britton and Dr. E. G. Love as experts

to examine into the state of the affairs, as to the working of the factory, the disposal of its waste material, the extent of water pollution and riparian injury, and the chemical history of the matters found on the bathing beach at Sea Cliff and in the waters that wash its shores; also to make suggestions as to the manner of abating such nuisance if found to exist. These gentlemen have concluded their labors, and their reports are here appended.

The inspectors found, as did the committee, in the investigations that some of the feed material falls into the creek through the loose planking at the dock, and that about twenty-eight tons of the solid material from the six thousand bushels of corn pass off into the creek at and near the factory.

The chemists and naturalists employed in the investigation have found respectively and without any attempt to confer with each other, or concert a measure of uniformity or harmony in their reports, that the ultimate outflow of water from the settling tanks and that the floating flakes and masses in the creek and the arm of the bay, when analyzed with greatest care, gives the following results.*

Results in Grains per gallon.	Water from Steeping tanks.	Water from Settling tanks.	Floating black masses.
Total solids	36.33	525.79	1591.85
Organic matter	25.95	438.55	561.31
Inorganic matter	10.38	87.24	1030.54
Sulphur	0.198	3.57	18.66
Nitrogen	2.22	29.12	20.81
Nitrogen, equivalent to albuminoids	14.33	187.89	134.28

The latest examination made, namely, late in November is as follows, the estimates being in each case for grains in U. S. gallon.†

	First.	Second.	Third.	Fourth.
Unfiltered.				
Organic	67.30	416.86	20.06	2530.30
Mineral	43.27	77.91	34.52	182.18
Total	110.57	494.77	54.58	2,712.48
Filtered.				
Organic	55.29	67.88	11.66	2,498.81
Mineral	39.89	73.95	33.82	181.62
Total	95.18	161.83	45.48	2,680.43
Suspended	15.39	332.94	9.10	22.05
Sulphur	0.408	2.507	....	‡112.55

*Of sixteen analyses of waste matters from the starch factories, the ones here quoted are as fair and favorable to the Glen Cove factory as any can be. The materials analyzed were taken during a cold period when there was no perceptible fermentation going on.

†These materials were obtained at Glen Cove after Nov. 15, and the analyses were completed before Nov. 28, 1883, by Prof. E. G. Love, public analyst.

‡Sulphate of lime.

What proportions of the corn are floated down the creek and cove.—The chemists who have been consulted, and the one hundred and fourteen analyses of Indian corn reported by the Department of Agriculture agree in the following average result:

Water	10.04 per cent
Ash	1.52 per cent
Oil	5.20 per cent
Carb. hydrates	70.69 per cent
Fibre	2.09 per cent
Albuminoids (Nitrogen equivalent = $1\frac{67}{100}$ per cent)	10.46 per cent

The data obtained from the Glen Cove Starch Factory show that 336,000 pounds (6,000 bushels) of corn are used up by the factory daily, that there are produced from this 168,000 pounds of starch, 76,000 pounds of feed (110,000 pounds water in combination with feed, about 34,000 such water), and 58,000 pounds refuse outflowing into the creek and cove. The chemists find that this refuse as cast away from the factory consists of:

First. Gluten and a small quantity of starch discharged from the settlers and the steeping water.

Second. Oil and mineral constituents from the steeping waters.

Third. A small quantity of loose material lost in winnowing. These waters after all "feed matter" has been separated, amount to about twenty-eight tons daily.

Of the albuminoid or glutenous matter, it is noticeable that it is in such a condition of minute suspension as practically to defy any mechanical means of separation from the water in which it is suspended. The last of the settling tubs has already received nearly all that can be deposited by mere subsidence, while the steeping waters can be made to yield scarcely any material by subsidence alone.

Observations upon the result of floating albuminoid matters in the creek and bay.—The inspectors and chemists found that as the albuminoids and analoyd materials float along the creek and to the salt water of the bay, the processes of coagulation and deposit go on. "At low tide," say the inspectors, "the rocks and wood-work are to be seen covered with the slime which has settled from the water, and in the creek the water is of a milky hue, due to the matter in suspension. Nearly all this matter is from the settling tubs. The water from the tubs, when it mixes with the creek water, parts with its starch, and the gluten gradually coagulates and sinks to the bottom. Here it soon decomposes, generates gases, and rises to the surface as foul-smelling black matters or scum."

The inspectors report that a considerable quantity of "feed" is dropped into the creek through loose planking of the factory dock, and that the steep waters contribute considerable vegetable oil, while there is a constant flow of bran, etc., from the winnowing. They say "all this organic material, amounting to about 58,000 pounds daily, is either deposited as slime, or carried out with the tides, in the form of finely divided particles in suspension, or as scum and black masses, and ebullition of the gases in the water of the creek is visible at all times. There is considerable sulphur in these gases, and its effect is seen upon

the painted sides of boats and buildings in the vicinity, blackened and discolored."

The inspectors also say "that the course of the current from the creek, on the ebb-tide, can be followed easily, when the water of the harbor is not rough, by its milky hue and the deposits of slime left behind. By these means it was ascertained that the current after leaving the creek flows along the sea-cliff shore as far as the steamboat dock, when it seems to shoot out into the harbor." Between this dock and the mouth of the creek are deposits of offensive slime in nearly all the depressions of the beach and on many of the stones.

The microscopic and chemical analyses show these deposits to have come from the starch works. Inspector Hollick concludes this statement upon this subject by saying: "It is altogether probable that certain areas of the harbor receive the residue of deposited matter, while the rest of the harbor is entirely free from it, the current of the creek and direction of the tides determining this. The characteristic stench of the starch works is plainly perceptible beyond the Sea Cliff dock and for an equal distance in all other directions, especially when the creek discharges its foul waters with the ebb-tide."

The same inspector adds as the conclusion reached by himself and his colleagues, "that we have failed to find any of the offensive matter complained of at any point east of the mouth of the creek;" also, "this is to be expected in view of the direction of the currents from the mouth of the creek."

This is an important point in view of its determining the direction in which the refuse stream from the factory may be turned into Hempstead bay and toward the sound with impunity.

How much waste material can be saved as "feed" out of 336,000 *pounds of corn used daily.* — No one who has been consulted, and especially no one directly responsible and interested in the Glen Cove Manufacturing Company, seems to doubt that the Messrs. Duryea have succeeded in rescuing as large a percentage of solid matter as any practicable mechanical means can enable them to save, and as stated by Superintendent John Duryea, there are 76,000 pounds of "feed" saved daily; and, as shown by the chemists, there are 34,000 pounds of water which pertains to the corn originally more or less liable to be incorporated with the 76,000 pounds. There seems to be no probability that if the 58,000 pounds which are not accounted for in any way except by the waste waters in the cove, little, if any more of the 168,000 pounds of the non-amyloid (non-starch) material can be rescued and held as solids. That amount of matter must pass away as water-carried refuse until it is in some manner precipitated by mechanical and chemico-mechanical agencies.

The deposits in the creek and cove and in the water of the bay. — The fact is well established that the glutinous material of the waste matters is rapidly deposited along the course of the currents between the factory and the middle or tide-axis, nearly north and south of Hempstead bay, and within an area that includes as its southern margin the waters that reach the foot of Sea Cliff at and near the Cliff steamboat landing. Further, that the water currents which determine the course of the floating matter toward Sea Cliff, on the one hand, and which deflect the water from the eastern side of the mouth of the cove on the

other, are so fixed by nature that there are points along the eastern side of the mouth of the cove and of the bay where all these wastes outflowing from the factory could be delivered, without harm and to the entire relief of the Glen Cove and Sea Cliff district.

A condition essentially necessary to the prevention of delay and to the beginning of fermentive processes in the waste material as it flows from the factory.— When perfectly fresh the glutinous and starch waste is readily floated without much precipitation, and could be conveyed a mile away, if necessary, in a smooth tube without obstructing such tube; whereas, if detained even for a few hours, whether subject to chemical treatment or not, precipitation and deposits which would occur would render the refuse matter difficult to conduct away and would at the same time become a source of offensive emanations near the factory, probably more offensive than any thing that now occurs. It is plainly a chemical and economical necessity to conduct away the outflow of wastes as rapidly as practicable.

CONCLUSIONS.

First. That the discharge of waste material of any kind into the creek from the factory should be entirely prevented.

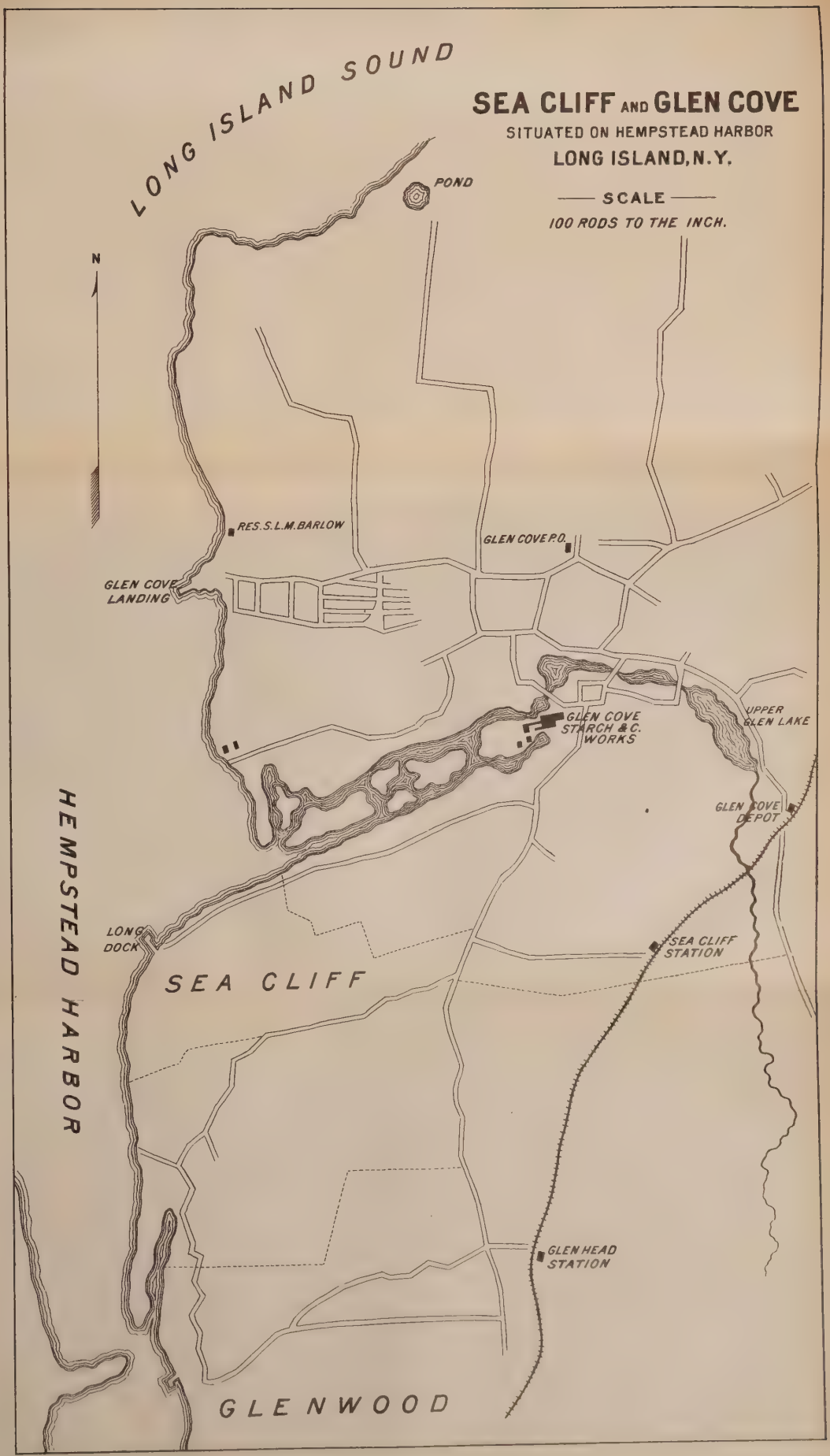
Second. That none of the sleeping and settling waters or other substances from the factory should enter the creek or any adjacent waters.

Third. That all waste fluids and water-carried materials consisting of out flowings from the factory should be conducted away by means of a perfectly closed tube along the right bank of the creek and bay to a suitable distance and proper place for discharge into a vat or receptacle where all such matter should be so chemically treated as to prevent any nuisance, and that the methods for such final disposal of fluid and water should be advised and determined by competent engineers and chemists at the earliest day practicable.

Respectfully submitted,

Committee, { J. SAVAGE DELAVAN, *Chairman.*
ERASTUS BROOKS,
ELISHA HARRIS, *Secretary.*

UPPER GLEN LAKE
LOWER GLEN LAKE
MUD FLAT
FILLED IN
LUMBER
LUMBER
MUD FLAT COVERED BY WATER KEPT IN BY DYKE
STREET
FRONT
DYKE
CLAY BEDS
MUD FLAT MARSH
MRS. E. McKENSIE
MARSH
SAND BEACH
CARPENTER'S DOCK
GARVIE'S POINT
GLEN COVE
S. L. M. BARLOW'S
GLEN COVE LANDING
SEA CLIFF
HEMPSTEAD HARBOR
SEA CLIFF DOCK
SCALE 800 FEET TO THE INCH.
MATINECOCK POINT
PEACOCK POINT
C. A. DANA'S ISLAND
DOSORIS
RED SPRING POINT
GLEN COVE
MOTT'S POINT
GLEN COVE LANDING
HEMPSTEAD HARBOR
SEA CLIFF
FORT WASHINGTON
GLENWOOD
N
SCALE 400 RODS TO THE INCH.


LONG ISLAND SOUND
SEA CLIFF AND GLEN COVE
SITUATED ON HEMPSTEAD HARBOR
LONG ISLAND, N.Y.
SCALE
100 RODS TO THE INCH.
N
POND
RES. S. L. M. BARLOW
GLEN COVE P.O.
GLEN COVE LANDING
GLEN COVE STARCH & C. WORKS
UPPER GLEN LAKE
GLEN COVE DEPOT
LONG DOCK
SEA CLIFF STATION
SEA CLIFF
HEMPSTEAD HARBOR
GLEN HEAD STATION
GLENWOOD

APPENDIX.

REPORT UPON THE STARCH WORKS OF THE GLEN COVE MANUFACTURING COMPANY, GLEN COVE, N. Y., BY ARTHUR HOLLICK, PH. B.

ELISHA HARRIS, M. D., *Secretary, N. Y. State Board of Health :*

SIR — According to instructions received from you, dated Albany, N. Y., September 22, 1883, I immediately commenced and have since completed the investigation of alleged nuisances caused by the starch works of the Glen Cove Manufacturing Company at Glen Cove, N. Y. Inspections were made upon the following dates : September 27 and 29 ; October 6, 26 and 27 ; November 3, 10 and 14.

Chemical and microscopical investigations were pursued between the above dates, in order to determine the nature and source of certain slimes and other offensive matter collected, as well as several species of marine algae which it was thought might possibly be connected with the foul odors complained of.

I am indebted to Mr. C. E. Munsell, Ph. B., for conducting the chemical analyses to successful results. Also for careful house-to-house inspection at Glen Cove and Sea Cliff, in order to discover any possible source of local nuisance from domestic arrangements.

Dr. N. L. Britton, of the Columbia College School of Mines, has named and catalogued the species of algae collected, besides making microscopical examinations of the slimes, etc. Both of these reports are appended in full.

The locality has been visited and carefully inspected at all phases of the tides and winds, but the cool weather has prevented a fair estimate to be made of what the conditions would be during continued hot weather. I am disposed to think that all the evils now apparent would be very much augmented by ordinary summer weather.

GENERAL DESCRIPTION.

The works of the Glen Cove Manufacturing Company are situated on a creek which empties into one of the arms of Hempstead harbor. This creek has been deepened and bulk-headed for some distance, so that vessels of considerable draught can go in and out at high-tide. All the waste from the works discharges into this creek. A dam has been constructed at the head of navigation, forming a pond of clear, fresh water, fed by a constant stream of small size, which is used throughout

the works, wherever water supply is needed. From the lower end of the bulk-head to the mouth of the creek there is an unbroken stretch of salt marsh, after which, in either direction, is a fine beach of sand and gravel. In addition to the manufacture of starch, the company also runs a glucose factory and deals in wood and lumber for building purposes. After careful examination I have to report that the only nuisances are caused by the starch works and I therefore confine myself to them.

PROCESS OF MANUFACTURE.

A brief description of the manufacture of starch, as pursued here, is as follows :

The corn is discharged from vessels by means of an elevator. A fan blower winnows the grains and cleans them of superfluous bran and dirt. The next process is steeping, in water, at a temperature of about 130 degrees to 140 degrees. When the corn is sufficiently softened by this means, the water is discharged into the creek, and the grains are run into the grinding room, where they are ground. The resulting mixture is then run through a series of strainers, the first one of wire, sixty meshes to the inch, and the other two of fine bolting cloth. The coarse solid matter retained by these strainers is the "feed," which is sold extensively for feeding cattle and fowls. The water which passes through the strainers carries the starch and fine gluten in mechanical suspension. It is then allowed to settle in the settling tubs for about twelve hours. The water is run off from the top of the tubs and again allowed to settle, after which it is discharged into the creek. The mixture of starch and gluten from the first settling is agitated in water, the starch allowed to settle a second time and the wash water discharged into the creek. It is from these waters, containing a large amount of gluten and some starch in fine mechanical suspension, that most of the trouble arises.

CAPACITY OF THE WORKS.

According to the statement of Mr. John Duryea, the superintendent, there is used each day about six thousand bushels of corn. Counting fifty-six pounds to the bushel, we have 336,000 pounds of corn per diem. Each bushel of corn yields about twenty-eight pounds of starch, which gives a daily production of 168,000 pounds of starch. The difference between the amount of corn used and the amount of starch manufactured will represent the refuse thus :

339,000 pounds of total corn used per diem.
168,000 pounds of total starch manufactured per diem.

168,000 pounds of total refuse per diem { 34,000 lbs. water. / 76,000 lbs. feed. / 58,000 lbs. not accounted for.

The 58,000 pounds not accounted for consists of *bran* and *fibre*, lost in the winnowing, *oil* and *mineral constituents* lost in the steeping waters, *starch* and *gluten* discharged from the settlers.

RESULTS OF INSPECTIONS.

At the head of the creek, where the waste waters are discharged, the nuisance is most apparent ; appealing both to sight and smell. At low

tide the rocks and wood-work are to be seen covered with the slime which has settled out of the water, and the water is at all times of a milky hue, due to the matter in suspension. Nearly all of this matter is from the settling tubs, and consists of starch and gluten. The water from the settling tubs when it mixes with the creek water, parts with its starch and gluten, which gradually coagulates and sinks to the bottom. Here it soon decomposes, generates gases and rises to the surface as foul smelling black masses or scum. In addition to this source of nuisance there is also quite a large amount of the "feed" dropped into the creek through the loose planking of the dock. The steeping waters also contribute considerable vegetable oil, and there is a constant shower of bran from the winnowing house. All this organic material, amounting to about 58,000 pounds per diem, is either deposited as slimes or carried out by the tides in the form of black masses, scum, or finely divided particles in suspension. The ebullition of the gases in the water of the creek can be seen at all times. There is evidently considerable sulphur in these gases, and its effect is seen upon the painted sides of boats and buildings in the vicinity, which are blackened and discolored. The course of the current from the creek on the ebb-tide can be followed quite easily, when the water of the harbor is not too rough, by its milky hue and the deposits of slime left behind. By these means it was ascertained that the current, after leaving the creek, flows along the Sea Cliff shore as far as the steamboat dock, when it seems to shoot out into the harbor. Between this dock and the mouth of the creek there were deposits of offensive slime in nearly all the depressions of the beach and on many of the stones. The microscopical and chemical analyses appended in full show these deposits to have come from the starch works. Beyond the steamboat landing there was but very little of the slime to be seen on the beach and the water was clear. From these facts it is very easily understood why certain parties living to the east of the dock should complain so earnestly, while others to the west of it should declare that they found nothing objectionable either on the beach or in the water. Just how and where the current deposits the remainder of its matter in suspension I am unable to state, but it is altogether probable that certain areas of the harbor receive it all and that the rest of the harbor is entirely free from it. The current of the creek and direction of the tides would determine this. The characteristic stench of the starch works is plainly perceptible beyond the Sea Cliff dock and for an equal distance in all other directions, especially when the creek discharges its foul waters with the ebb-tide.

Remedies Proposed.

In order to retain and recover the organic matter now discharged with the settling and steeping waters, I would propose a series of settling boxes through which these waters be made to flow. The longer these waters can be retained the more will the organic matter tend to coagulate and settle. The outlets should be provided with strainers, and whatever matter still remains in suspension at the end of the series might be precipitated by chemical reagents. This plan could be tried upon a small scale with very little expense, and its practicability determined.

I would also recommend that the dock and bulk-head, where the "feed" is stored and handled, be made thoroughly tight, and every crevice caulked, so that no particles of feed or water from the same can find their way into the creek.

The main causes of the stenches will be thus obviated, but the creek itself would need to be dredged and cleaned of its foul coating in order to make the effect complete.

It should be borne in mind that there will always be more or less waste from the works which will find its way into the creek, due to the handling of feed and corn at the dock, and to other causes. It is not, therefore, to be expected that the water of the creek can ever be made entirely inoffensive and for that reason I think it would be well if a bulk-head were constructed at the mouth of the creek from its western bank and extending out into the harbor. This would divert the current out into the harbor instead of allowing it to flow along the shore to Sea Cliff and deposit its offensive matter on the beach.

It is, however, always a delicate matter to try and force any natural water-way out of its ordinary course, and the proposed plan might so alter the prevailing conditions as to result in the formation of shoals or sand-bars which would prove dangerous to navigation. The better idea is to make the water of the creek as sweet as possible by removing every source of nuisance, and then allowing the natural currents to flow as they please.

I would add in conclusion, that we have failed to find any of the offensive matter complained of at any point east of the mouth of the creek, which is to be expected from the direction of the current. The stench from the creek is, however, perceptible for a considerable distance in that direction. For particulars of analyses I refer to the elaborate reports of Messrs. Britton and Munsell.

Respectfully submitted,
ARTHUR HOLLICK, PH. B.,
Inspector.

Dated NEW YORK, *November* 17, 1883.

REPORT ON THE STARCH WORKS OF THE GLEN COVE MANUFACTURING COMPANY, GLEN COVE, N. Y.

The following is the average of one hundred and fourteen analyses of Indian corn, from various parts of the United States, as given on page 66 of the report on the composition of American wheat and corn, issued by the department of agriculture, Washington, 1883 :

	Per Cent.
Water	10.04
Ash	1.52
Oil	5.20
Carbhydrates	70.69
Fibre	2.09
Albuminoids (Nitrogen 1.67 per cent)	10.46

In the process of manufacture of starch or glucose the main considerations is to remove the starch as pure as possible from the remainder of the corn, and as an incidental product, to save all the refuse that can be economically prevented from running to waste, for use as feed for cattle, horses, poultry and swine; said feed is commonly called "starch feed" or "glucose meal."

According to the statement of the president of the company, they grind 5,550 bushels of corn for five days of each week, and from this produce twenty-six to thirty pounds of pure, dry starch per bushel of corn, an average of twenty-eight pounds per bushel, or 155,400 pounds per day.

As one bushel of corn weighs on an average fifty-six pounds, the 5,550 bushels used daily weigh 310,800 pounds, from which about 4,000 pounds of bran, pieces of cob, dirt, etc., are removed by a fan-blower, leaving 306,800 pounds of clean corn, of which 155,400 pounds are converted into starch or from that into glucose, and (from the above analysis) 10.04 per cent, or 30,800 pounds, is the natural moisture in the corn; so that 190,200 pounds are accounted for; and 120,600 pounds go into the feed, or are lost in the various waste-waters in the course of manufacture, and run into the creek, and thence into Hempstead harbor, producing the stenches, by their decomposition, against which complaint is made.

According to the books of the company the daily production of rescued solid material, which is used as feed for cattle and other animals, is 3,350 bushels per day from 5,550 bushels of corn used; this is the quantity reported as sold, but the records are not full, as no exact measurement is taken, the measures being frequently heaped, so as to contain nearly one-and-a-half bushels, and the amount of moisture varies from sixty to seventy-two per cent; thirty-three bushels are counted to the ton, so that one bushel weighs about sixty pounds, and 3,350 bushels weigh 201,000 pounds, of which (according to the analysis given below) over sixty-two per cent, or 125,000 pounds, are water and 76,000 pounds are rescued solid material.

An analysis of this feed by E. H. Jenkins of the Connecticut Agricultural Station (Substance XLVI), in the report for 1878, gives the following results as the composition of the fresh feed:

	Per Cent.
Water	62.27
Ash	.27
Oil	1.31
Carbhydrates	28.90
Fiber	1.58
Albuminoids	5.67

We have shown before that 120,600 pounds of the 5,550 bushels of corn are not accounted for as starch, natural moisture, or winnowings; subtracting from this the 76,000 pounds of solid material in the feed, we have 44,600 pounds, for five days of each week, of solid material that is worse than wasted.

This 44,600 pounds of wasted material is divided among the various constituents of the corn as follows :

Waste Material from the Glen Cove Starch Factory.

	Corn, per cent.	Corn, pounds. 5,550 bushels at 56 pounds=310,800 pounds less 4,000 pounds = 306,800 pounds.	Feed, per cent.	Feed, pounds. 3,350 bushels of 60 pounds each or 201,000 pounds.	Loss, pounds.
Water.....	10.04	30,803	62.27	125,020	
Ash	1.52	4,663	.27	600	4,063
Oil.....	5.20	15,954	1.31	2,610	13,344
Carbhydrates	70.69	216,877	28.90	58,090	3,387
Starch, 155,400 pounds					
Fiber.....	2.09	6,412	1.58	3,220	3,192
Albuminoids.	10.46	32,091	5.67	11,460	20,631
		306,800		201,000	44,617

ANALYSES OF THE WASTE WATERS FROM THE GLEN COVE STARCH FACTORY.

First. Waste water from steeping cisterns.
Second. Waste water from settling cisterns or starch runs.
Third. Waste water from starch-tables.
Fourth. Waste water from filter presses.

(*Parts in* 1,000,000.)

Unfiltered :	First.	Second.	Third.	Fourth.
Organic.....	1,154	7,148	344	*43,388
Mineral	742	1,336	592	†3,124
Total	1,896	8,484	936	46,512
Filtered :				
Organic.....	948	1,164	200	42,848
Mineral	684	1,268	580	3,116
Total	1,632	2,432	780	45,964
Suspended	264	6,052	156	548
Sulphur	7	43	.....	†1,930
Reaction	Neutral.	Neutral.	Alkaline.	Acid.

* Glucose. † Sulphate of lime.

ANALYSES OF THE WASTE WATERS FROM THE GLEN COVE STARCH FACTORY.

First. Waste water from steeping cisterns.
Second. Waste water from settling cisterns or starch runs.
Third. Waste water from starch tables.
Fourth. Waste water from filter presses.

Grains in one United States gallon (231 cubic inches).

	First. Gallons per day.	Second. Gallons per day.	Third. Gallons per day.	Fourth. Gallons per week.
Quantity of water	30,000	300,000	100,000	4,000
Reaction	Neutral.	Neutral.	Alkaline.	Acid.
Unfiltered:				
Organic	67.30	416.86	20.06	*2530.30
Mineral	43.27	77.91	34.52	†182.18
Total	110.57	494.77	54.58	2712.48
Filtered:				
Organic	55.29	67.88	11.66	2498.81
Mineral	39.89	73.95	33.82	181.62
Total	95.18	161.83	45.48	2680.43
Suspended	15.39	322.94	9.10	32.05
Sulphur	0.408	2.507	.....	†112.55

As shown by A. L. Colby's report on the glucose factories at Buffalo, the first waste waters are from the steeping tanks. At the Glen Cove factory there are three tanks for steeping, holding about 5,500 bushels of corn each. Through each of these there is a continuous stream of water heated to 130 to 140 degrees Fahrenheit, which flows for three days at the rate of about 10,000 gallons into each tank per day. An analysis of this (No. 1) gives 110.57 grains per gallon for first day's run, while for the third day (Dr. Love's analysis, No. 1) there is but 36.33 grains per gallon, and the second day's can be taken as the average of these; or

First day, 1,105,700 grains in 10,000 gallons.
Second day, 734,500 grains in 10,000 gallons.
Third day, 363,300 grains in 10,000 gallons.

Total, 2,203,500 grains in 30,000 gallons, or 315 pounds per day from all three tanks, which may be divided into:

128 pounds oil and other organic substances.
61 pounds albuminoids.
126 pounds ash of corn and mineral constituents of the water.

315 pounds.

* Glucose. † Sulphate of lime.

The oil can be seen floating on the creek in iridescent films.

The water from the settling cisterns or starch runs, or the tanks into which the paste from the mills is collected and the impure starch settled (for details see A. L. Colby's report), contains large quantities of gluten and other albuminoids, as well as carbhydrates, which flow into the creek and there decompose, ferment, putrefy and stink as do other nitrogenized and sulphurous compounds.

The analysis of this water shows 494.77 grains to the gallon, or for 300,000 gallons 148,431,000 grains, or 21,205 pounds of total solid material flowing into the creek for five days per week, of which 77.91 grains to the gallon, or 3,340 pounds in 300,000 gallons, are mineral constituents.

According to Dr. E. G. Love's analysis, this contains 187.89 grains per gallon of albuminoids, and 3.57 grains per gallon of sulphur, or for 300,000 gallons, 8,052 pounds of albuminoids and 153 pounds of sulphur, which by decomposition would generate 1,698 cubic feet of sulphuretted hydrogen; large quantities of this sulphuretted hydrogen are evolved, particularly during warm weather; this accounts not only for the stenches, but also for the darkening of paint on houses and boats and the blackening of silverware.

The water from the starch tables is principally mineral from the alkali added in treating the impure starch from the settling cisterns; it contains:

Organic, 20.06 grains per gallon equal 287 pounds in 100,000 gallons.
Mineral, 34.50 grains per gallon equal 493 pounds in 100,000 gallons.

Total, 54.58 grains per gallon equal 780 pounds in 100,000 gallons.

The waste water from washing the filter presses is small in quantity, and consists almost entirely of glucose and sulphate of lime; there is only about 4,000 gallons per week.

Glucose	2530.30 grains per gallon,	1446 lbs. in 4,000 gals.
Sulphate of lime..	182.18 grains per gallon,	104 lbs. in 4,000 gals.
Total	2712.48 grains per gallon,	1550 lbs. in 4,000 gals.

Mr. Edgar E. Duryea presents the following as analyses of the water used in treating the corn or starch, the amounts of which should be deducted from the amounts of solid materials in the waste waters; this water used on the tables contains a large amount of alkali.

	Steeping cisterns. per cent.	Settling cisterns. per cent.	Tables.* per cent.
Ash	.07392	.050	.42
Organic substance.....	.16983	.242	.36
Total residue	.24375	.292	.78
	In 30,000 gals. 607 pounds.	In 300,000 gals. 7,270 pounds.	In 100,000 gals. 6,474 pounds.

* There is probably an error in the decimal point in this analysis, .078 per cent or 647 pounds of total residue would be more accurate.

Mr. Wright Duryea gives the following statement:

Average grinding per day, 5,550 bushels; 5,550 bushels of corn at 56 pounds per bushel, 310,800 pounds.

How accounted for:

Material reclaimed from the above quantity of corn, starch, feed, etc., 299,695 pounds; balance unaccounted for, 11,105 pounds, or about 5½ tons.

From the foregoing analyses of waste waters it appears that the stenches complained of are derived almost entirely from the decomposition of the albuminoids contained in the waste water from the settling cisterns. These albuminoids become infinitesimally divided on decomposing, and settle to the bottom of the water. When putrification has progressed sufficiently to evolve sulphurous gases they conglomerate and rise to the surface in black masses (sample C of Dr. Britton's report, to which refer for physical conditions and description), an analysis of which gave the following results:

	Per Cent
Water	95·95
Decomposed organic matter	1·99
Soluble mineral constituents	1·16
Insoluble mineral constituents	·90
Sulphur	0.0202

Dr. Love's analysis of similar masses gave:

	Grains to U S. gallon.
Organic	561.31
Mineral	1030.54
Sulphur	18.66
Albuminoids (Nitrogen 20.81)	134.28

These masses float with the tide, break into black specks and settle when the sulphurous gases have escaped on the borders of the creek, or are washed out to Hempstead harbor by the receding tide.

Analysis of the slime from the beach near Mrs. Richardson's bathing-house. (Sample F, Dr. Britton's report.) In 231.8 grammes of sand, water and slime:

212.90 grammes sand.
15.37 grammes water.
3.53 grammes slime.

231.80 grammes

An analysis of this slime gave.

Decomposed organic matter	1.474 grammes	equal to 41.8 per cent.
Soluble mineral matter	1.257 grammes	equal to 35.6 per cent.
Insoluble mineral matter	.799 grammes	equal to 22.7 per cent.
	3.530 grammes	equal to 100. per cent.

This slime evolved large quantities of sulphuretted hydrogen at first, but as it was some time before the analysis could be made, only a small quantity (0.0247 per cent of entire slime and sand) was found in the residue from which the sand had been removed. The above analysis shows this slime to be essentially the same as the floating black masses, the sulphuretted hydrogen having escaped.

A careful house-to-house inspection was made from Glen Cove to the water-works at Sea Cliff, but no cause for the stenches complained of were apparent. There were no overflowing cess-pools discovered, nor any house drainage along the margin of Hempstead bay; the refuse from cess-pools and privies being generally carted off to the farms in the vicinity Probably the lateness of the season (November), when these inspections were made, and the few winter residents of Sea Cliff accounted in great measure for the want of odors evolved from privies and cess-pools. The only odors of this nature discovered were evolved by the pig-styes and privies in the rear of the houses on the east side of Front street (South Glen Cove) near the dyke, and these were entirely insufficient to account for any of the odors complained of, as they were not perceptible for any great distance from their sources.

Respectfully submitted,

CHARLES E. MUNSELL.

COLUMBIA COLLEGE, NEW YORK, *November* 17, 1883.

Mr. ARTHUR HOLLICK, *Inspector, New York State Board of Health :*

DEAR SIR — In accordance with the request made by, and the agreement made with you on the 1st day of October, 1883, I have visited the Glen Cove Starch Factory and its vicinity at several times since that date and collected a number of samples of the waste products of the starch manufacture, both before and after organic decomposition has begun in those substances, and at various localities in the creek and along its banks. These samples have been submitted to microscopical examination. I have also collected an extensive series of specimens illustrative of the Alga flora of the salt marshes and meadows bordering Glen Cove creek, and the adjacent shores of Hempstead harbor for a considerable distance on each side of the mouth of the creek.

I herewith submit the results of my examinations.

MICROSCOPICAL EXAMINATIONS OF THE WASTES.

(*a*) *Fluid taken from the settling vats.*—A milky-white, turbid liquid, with no appreciable odor. Under the microscope, using an amplification of about 500 diameters, this is seen to contain many grains of starch and some fragments of vegetable cells; the glutinous matters, being transparent, do not appear in the field of the microscope.

(*b*) *Light-colored masses floating in the creek.*— Consist mostly of starch grains and cell fragments, and emitted no unpleasant odor. I suspect that this sample is starch or starch-feed accidentally thrown or blown into the water.

(*c*) *Dark-colored, semi-gelatinous, decomposing, highly offensive floating masses in the creek close to the factory.*— With a magnifying power of one hundred diameters, nothing definite was distinguished, except some few grains of sand. Under five hundred diameters it appears as intensely finely divided organic material in which a few grains of sand and clay are contained; and with about six hundred and fifty diameters, the finely divided material is plainly seen to consist of separate grains which are probably the coagulated gluten. When first examined this material swarmed with *Bacterium termo, which* later on disappeared.

(*d*) *Similar masses collected further down the creek.*— The microscope shows a structure parellel with that of sample (c). *Bacterium termo* is abundant. A few fragments of *Beggiatoa* were noticed.

(*e*) *Similar masses collected at the mouth of the creek.*— In every way similar to sample (d).

(*f*) *Dark-colored, highly-offensive, gelatinous deposit on the gravel, just at low water mark on the beach near the bathing-houses at Sea Cliff.*— This substance agrees in all essential particulars with samples (c), (d), and (e), and is doubtless the same material. Bacteria were very abundant when the sample was first examined. Infusoria were also noticed in this sample as well as in samples (c) and (e).

Notes on the Algæ Collected.

This branch of the inquiry was taken up with the disadvantage of the lateness of the season to contend with. And while it has been conclusively shown that these organisms have little or nothing to do with the production of the disagreeable odors emanating from the creek at the time of year the investigation was conducted, yet the following list of species detected could, doubtless, have been greatly enlarged if taken up earlier.

List of Algæ.

Cryptophyceæ.

The genera composing this order are the lowest of the Algæ and of small size. Much of the characteristic sea-side and salt marsh odor is produced by their growth and decay.

Beggiatoa alba, Treves, *Var marina*, Warming. On *Ulvæ*, submerged at low-tide near the mouth of Glen Cove creek, fragments floating in the waters of the creek, on decaying culms of grasses in the creek near Dosoris. This plant, as well as the other species of the genus, give off hydro-sulphuric acid gas. Special search was made for them but they were only found in small quantities, entirely insufficient to yield much odor, and are probably no more abundant in Hempstead harbor than anywhere else in similar situations along the coast.

Oscillatoria subuliformis, Harv. With *Ulothrix* on the shore at Sea Cliff at low tide.

Lyngbya æstuarii, Liebm. Near the dyke in Glen Cove creek at low-tide, and on the shore of the creek.

The *Lyngbyæ* emit a disagreeable odor, different entirely, however, from that emanating from the decomposing waste products of the starch factory and not so offensive.

Isactis plana, Thuret. On the shore at low-tide east of Glen Cove creek.

Zoosporeae.

Ulva Lactuca (Linn), Le Jolis. Several forms. In tide pools on the marshes along Glen Cove creek and near its mouth; abundant between tide-marks, on the shore east of the creek and in some quantity at Sea Cliff. *Ulva enteromorpha,* Le Jolis. With the former species; abundant. These two plants are commonly called "Sea Lettuce."

Ulothrix flacca (Dillw.), Thuret. Near the dyke in Glen Cove creek at low tide-mark; on the sand beach at Sea Cliff; and on the shore east of Glen Cove creek at low-tide.

Cladophora arcta (Dillw.) Among rocks, on the shore, east of the creek.

Cladophora albida (Huds.), Kutz. Edges of salt meadows along the creek; and on the shore east of its mouth at half-tide.

Ectocarpus confervoides (Roth.), Le Jolis, Var. *siliculosus,* Kjellm. In tide-pools along the creek.

Ectocarpus littoralis, Lyngb. On rockweed on the shore east of the creek.

Oosporeae.

Ascophyllum nodosum, Le Jolis. Very abundant and growing in large masses on the rocks along the shore east of the creek, and at Sea Cliff.

Fucus vesiculosus, Linn. Very abundant with the former species on the rocks. These two plants are commonly known as "rockweed."

Florideae.

Cystoclonium purpurascens, Kutz. Thrown up on the shore east of Glen Cove creek.

Rhabdonia tenera, Ag. On the shore at Sea Cliff, and east of the creek; detached.

Grinnellia Americana, Harv. A single fragment on the shore near Dosoris.

Polysiphonia violacea, Grev. On submerged rocks near Dosoris.

All of which is respectfully submitted,

N. L. BRITTON, Ph. D.

REPORT

ON DRAINAGE OF ABANDONED CANAL AT VILLAGE OF HORSEHEADS.

ROCHESTER, N. Y., *April* 23, 1883.

Dr. ELISHA HARRIS, Esq., *Secretary of State Board of Health:*

DEAR SIR — In accordance with recent instructions from your board to investigate what means can be adopted to remove the stagnant waters in certain unreleased sections of the summit level of the abandoned Chemung canal in the town of Horseheads, Chemung county, N. Y., the undersigned begs leave to state that on the 10th inst., he made a thorough examination of the locality in company with Mr. Thos. Evershed, division engineer of the western division of the State canals, and a second examination alone on the 21st inst., the results of which are respectfully submitted in the following report:

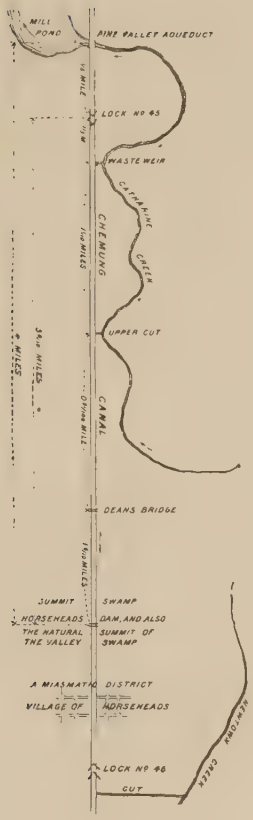
The general conditions of the problem here presented have already been fully described in the reports made by the undersigned to your Board under the dates of June 19, 1882, and July 20, 1882, so that any repetition of the facts therein stated respecting the topography of the district and the complications attending the sanitary drainage of the abandoned canal may be regarded as unnecessary in this report. It will, therefore, suffice to indicate briefly that the district under consideration is in general an extensive natural swamp, lying in a broad valley, and forming the summit of the two distinct water-sheds which terminate respectively at Seneca lake on the north; and at the Chemung river on the south, and that through this swampy district the summit level of the Chemung canal had formerly been constructed, principally in excavation, so that the bottom of the prism is several feet below the general level of the adjacent ground for the greater portion of the distance.

The entire length of the summit level, which extends from the hamlet of Pine Valley to the first lock south of the village of Horseheads, is about five and six-tenths miles. Of this, the section from Pine Valley to Dean's Bridge, a distance of two and two-tenths miles, was drained last year, and is yet in comparatively good order; the following section, from Dean's Bridge to the southern part of the village of Horseheads, is nearly two and seven-tenths miles long, and has not yet been drained; the remaining section southerly to the lock is only about seven-tenths of a mile in length, and is thoroughly drained and partially refilled in several places. The intermediate section, from Dean's Bridge to the southern part of the village of Horseheads, is accordingly the only undrained portion of the summit level, and to this your attention is now called by request of the citizens of Horseheads.

In consequence of the want of a natural water-course through the summit swamp, the drainage of the prism can only be effected by the construction of deep ditches in the bed of the canal extending from the crest of the water-shed northerly and southerly to points where Catherine creek and Newtown creek have attained sufficient fall to afford outlets for the water intercepted by the canal excavation. Such points are now found respectively at Pine Valley and Horseheads, and might be utilized if the means to *complete* the drainage were available; but as the unexpended balance of about $1,100 of the drainage appropriation made in 1881 is much too small to accomplish the purpose, it may be advisable to retain this balance for the present and add it to a future appropriation of sufficient amount to insure the completion of the work in a thorough manner.

An examination of the district reveals the fact that the canal prism is the receptacle of the drainage waters from the adjacent wet lands wherever an attempt to improve and utilize them has been made by their owners in the region of the natural summit. No other outfall for such waters is available unless the channels of Catharine creek and Newtown creek are deepened. If the canal excavation were refilled and the original surface of the ground restored as it was formerly, some of the most productive and valuable lands in the valley would quickly return to their original swampy condition and become practically worthless until drained by another main ditch constructed upon the site of the canal. The latter is, therefore, of much use to the adjoining land-owners, and it is manifestly advantageous to them that it be kept open. But as the canal was built with its bottom substantially level, the water intercepted by it does not readily flow away and accordingly becomes a nuisance which demands abatement. Now as the district is actually upon two distinct water-sheds, it becomes a matter of considerable importance to determine closely the location of the dividing ridge or crest, so as to avoid legal complications resulting from a diversion of the natural flow of the drainage waters. The town board of health of Horseheads were, therefore, requested to cause accurate surveys to be made last year, with the view of establishing the position of this natural low elevation or ridge, and thus also of determining the length of the ditches which the State was requested to excavate in the bottom of the abandoned canal in a northerly and southerly direction respectively.

These surveys and the verification of them, which was made by Mr. Evershed and the undersigned on the 10th inst., indicate that the crest of the original summit swamp is at or near the site of the present earthen dam across the prism on the north line of the lands owned by Benjamin Westlake, and constructed both for the purpose of enabling the village of Horseheads to regulate the depth of the water in said canal through the village in accordance with the provisions of act chapter 379, Laws of 1880, and also of preventing any intercepted drainage waters from the southern water-shed from flowing northerly through the canal into a different natural out-fall. In previous communications to your Board, this embankment or barrier across the prism has been designated the "*Horseheads or Summit dam*," which appellation will, for the sake of convenience, be retained in this report. It, therefore, follows that all intercepted water north of this dam should flow into Catharine creek and thence into Seneca lake,


MILL POND
PINE VALLEY AQUEDUCT
½ MILE
LOCK No 45
WASTE WEIR
CATHARINE CREEK
CHEMUNG
1½ MILES
UPPER CUT
3½ MILES
5 MILES
CANAL
DEANS BRIDGE
1½ MILES
SUMMIT
SWAMP
HORSEHEADS
DAM, AND ALSO
THE NATURAL
SUMMIT OF
THE VALLEY
SWAMP
A MIASMATIC DISTRICT
VILLAGE OF
HORSEHEADS
CATLIN'S CREEK
LOCK No 46
CUT

while all that is intercepted by the canal excavation south of the dam should find an out-fall into Newtown creek and thence into the Chemung river. Any other method of disposing of the natural drainage-waters might give rise to litigations unless proper agreements could be made between all parties interested, or owning lands or water-privileges along said streams, and to this element in the problem reference will again be made below.

Now from the summit dam to the present cut through the towing-path bank into Catharine creek, 4,800 feet north of Dean's Bridge, the distance is about two and one-half miles; and at said cut the surface of usual low water in the creek is only about two and one-half feet below the bottom of the canal prism. The available fall for a ditch in the prism is accordingly only about one foot per mile, which is too small for insuring reasonable permanency; and hence either the water surface in Catharine creek must be lowered by a proper regulation of its channel, or else the ditch in the prism must be extended still further northerly to a point where the creek has attained a greater depth below the level of the canal bottom. At the waste-weir outlet, three and six-tenths miles north of the summit dam and about 1,000 feet south of lock No. 45, at Pine valley, the creek's surface is about five and one-half feet below the level of the canal bottom, thus affording a grade about one and one-half feet per mile for the ditch, which will still be insufficient. Four miles north of the dam, the canal formerly crossed over Catharine creek by means of a very low aqueduct, and here a fall of about nine feet becomes available without interfering with a mill privilege, so that the resulting grade for the ditch would be nearly two and one-half feet per mile. The grade of the ditch should, however, be about five feet per mile in order to keep itself clear of silt and to avoid constant expenditure for maintenance; and it will, therefore, be apparent that the construction of so long a ditch will become inexpedient in view of the slight available fall, unless the mill privilege at Pine Valley is destroyed. An excavation of this magnitude would, moreover, cause the drainage ditch to become lower than the natural water-course, and it will, therefore, be far more rational to deepen and regulate the creek than to dig an artificial channel in the bed of the prism. Accordingly if the natural channel of Catharine creek is not deepened from Pine valley to the present cut 4,800 feet north of Dean's Bridge, so as to afford adequate out-fall far the water which is now stagnant in the canal bottom from the summit dam to Dean's Bridge, the only practicable method left of obtaining a northerly flow of the drainage waters in this section will be to refill the prism partially, and then to grade the elevated bottom in a proper manner.

Such a procedure would, however, cause great injury to the adjoining low lands which are now rendered extremely valuable in consequence of the drainage facilities afforded by the canal excavation; and hence it is evident that the owners of the adjacent lands should co-operate with the State in securing efficient drainage and thereby abating the nuisance complained of upon the land owned by the State. I would, therefore, recommend that the attention of these owners be directed to a comprehensive plan for draining the entire northern slope of the summit swamp, and that further expenditure on the part of the State be delayed in this section of the canal until a sufficient sum of

money becomes available for the execution of a general plan of drainage which will have for its purpose not only the removal of the comparatively small amount of stagnant water upon the bed of the canal, but also the drainage of many hundred acres of marshy and saturated lands lying in the valley between lock No. 45 and the summit dam.

If a *diversion of a portion* of the drainage waters belonging naturally to the northern or Catharine creek area be permitted, however, then a large part of the section of one and sixth-tenths miles in length from the summit dam to Dean's Bridge could readily be drained southerly into Newtown creek by cutting through said summit dam and allowing the intercepted water north of the dam to flow through a ditch to be excavated in the bottom of the prism and terminating at a point south of Franklin street in the village of Horseheads, whence the waters would be discharged through a covered sewer or drain into Newtown creek below the mill-dam at the foot of Mill street. To prevent undue floods from being thus diverted from one natural drainage area to another, the summit dam should merely be *perforated* by a comparatively small pipe of iron or well protected tile, which would permit the passage of only a limited quantity of water, and thus practically retain large volumes of water upon their respective areas. In this manner a longer extent of the summit level could be drained than is at present practicable without such diversion of the waters, but the execution of this plan is attended with legal complications as has already been mentioned. It may be urged that no one along the course of either Catharine creek or Newtown creek would object to the proposed plan, and doubtless this may be true; yet in view of the possibility of a suit for damages in consequence of altering the natural flow of a small portion even of the drainage waters, the above suggestions cannot be recommended until all of the interested parties have given thereto their written consent. The proper form of such a document and the manner of securing the necessary signatures need not be discussed in this report, and it is sufficient for the present only to call attention to the points involved.

The drainage of the section of the prism *south* of the summit dam is now a comparatively simple matter, and has been briefly outlined in the foregoing paragraph. This section extends from the summit dam to a point about 700 feet north of Mill street in the village of Horseheads, where the canal excavation has been largely refilled with earth to form the road-bed of the Chemung Canal railroad. Mill street also has been cut down so as to cross the railroad on grade; and south of said street the prism has likewise been partially refilled in several places, so that the excavation of an open trench or ditch to the lock south of the village would be both very unsatisfactory and expensive, as the lock is about two-thirds of a mile distant. At the foot of Mill street there is a mill-dam across Newtown creek as indicated upon the accompanying map, and the water in the creek *above* the dam is nearly level with the bottom of the prism in low stages, while *below* the dam the creek is about eight feet below said bottom. Now, as the distance from the mill-dam to the summit dam is about one and one-quarter miles, it will be seen that an ample fall is available for the drainage ditch in the prism, and also that by utilizing the whole of this fall, a portion of it may serve for a part of the undrained section of the canal north of the summit dam, provided that such a diversion of the

water be granted. In view of the conditions presented, it is obvious that the creek below the mill-dam affords a ready outfall for the drainage waters intercepted by the abandoned canal, and the manner of conveying the water into the creek now only remains to be considered.

An open ditch cannot well be constructed and maintained from the mill-dam 700 feet north, as it would cross the street leading to the mill in deep cutting, and would interfere with the railroad on the one hand, or would be liable to become flooded by a rise in the creek on the other. For practical as well as economical reasons, therefore, this portion of the outlet should be a covered sewer, extending from the point above mentioned along the east side of the railway to the tail-race of the mill, a distance of about 800 feet. The owners of the mill and water privilege, Messrs. Charles Kline, Samuel Hall and Israel McDanolds, claim that the spring waters now intercepted by the canal formerly found an outlet into Newtown creek, and that, in strict equity, said waters should be returned into the creek above their dam, so as to increase their water power; but they express their willingness to waive this latter claim on condition that the outfall sewer be constructed in such manner as to enable them to draw off from said sewer the whole or any desired portion of its flow through a short lateral branch, extending into the basement of their mill, and at the level of their tail-race. In consideration of the performance of this small additional amount of work, they furthermore express their willingness to grant free right of way for the construction of said sewer in front of their mill and through their lands into their tail-race, the level of which is here somewhat lower than that of the creek adjoining. To these propositions no serious objections can be raised, and it is only to be suggested that the agreements be properly executed before the work is commenced.

From the foregoing it will now be seen that the drainage of the greater portion of the undrained section of the summit level can readily be effected as follows:

1. By constructing a covered sewer or drain about 800 feet long from the tail-race of Kline & Co.'s mill to an opening under the canal railroad into the abandoned canal. The cost of this sewer with its adjuncts will probably amount to $1,600.

2. By excavating in the bottom of the canal prism from the head of the covered sewer to the summit dam, an open ditch of sufficient width and depth; the length of this ditch will be about 5,700 feet, and its cost, together with that of suitable culverts under the several streets and the U., I. & E. R. R. embankment, is estimated at about $2,500.

3. By excavating a similar, but smaller ditch in the bottom of the feeder, from the aforesaid main ditch in the canal to the foot of the first lock, a distance of about 700 feet. The cost of this lateral ditch will be about $200.

4. By perforating the summit dam with a small pipe, deepening the main ditch southerly and then continuing the ditch for about 3,000 feet north of said dam, where its grade would run out, and hence its efficiency cease. The cost of this work would be about $1,500.

The total cost of draining a length of nearly 9,000 feet of the summit level, together with about 700 feet of the feeder prism, from the southern part of the village of Horseheads to a point about 3,000 feet north of the summit dam, will thus be about $5,800, exclusive of any

expense for engineering and superintendence, and also provided that the diversion of water thereby involved would not give rise to any claim for damages. The estimate is furthermore based on the assumption of using an eighteen-inch vitrified tile pipe for the main outfall sewer and culverts, and a nine-inch tile-pipe under the present summit dam. It is possible that the main sewer tile should be somewhat larger in diameter, in which case the cost would be correspondingly increased, but from the statements of residents and my own observations, I consider the diameter mentioned will be sufficient so long as the village of Horseheads does not construct sewers and discharge large quantities of storm water into the outfall, which is designed only for the drainage of the canal prism and a small amount of adjoining land.

It should, however, be here remarked that the drainage work outlined above will also be of use to numerous abutting land-owners by enabling them to drain a large area of marshy soil into the ditch at a comparatively trifling expense. Provision for such improvements should, therefore, be made in the construction of the outlet sewer, and the additional cost thereof should justly be paid by those directly benefited; but before a rational estimate can be made, more extended surveys and examinations are necessary, as much depends upon the area to be drained and the character of the soil.

Respecting the duty of the State in providing an outlet for the drainage waters which are now conducted into and intercepted by this section of the summit level of the abandoned canal, little need be said in this report, as the subject is not within my province; and it will, therefore, be sufficient to indicate how much of the total length of two and seven-tenths miles of undrained prism, extending from the southern part of the village of Horseheads to Dean's Bridge, still remains the property of the State, and also how much thereof has been acquired by abutting owners through properly executed releases, or by direct purchase, as in the case of the Chemung Canal Railroad Company. For this purpose, I beg to call your attention to the accompanying map of the locality, which I have accurately reduced for your convenience, from a large tracing or map drawn by Mr. M. Rickey, from actual surveys made for the village and town boards of health, and upon which the names of adjacent owners are written, together with the length of frontage upon the canal and feeder. But as it may be more desirable to submit the matter in tabular form, it has accordingly been arranged as follows:

Statement showing names of property-owners abutting on Chemung canal from the southern terminus of the undrained section to Dean's Bridge.

I. EAST SIDE OF CANAL.			II WEST SIDE OF CANAL.		
NAME OF ABUTTING OWNER.	Length in feet along canal.	Remarks.	NAME OF ABUTTING OWNER.	Length in feet along canal.	Remarks.
Canal R. R. Co...	1,700	Owner by direct purchase.	Canal R. R. Co... ...	1,700	Owner by direct purchase.
Daniel Rockwell.....	190	Not released.	Daniel Rockwell. ..	190	Not released
A. M. Palmer..	98	Not released.	A. M. Palmer.... ...	98	Not released.
John Butcher.....	96	Not released.	John Butcher...	96	Not released.
A. C. Weston...	100	Not released.	A. C. Weston	100	Not released.
Caroline Boetaker ...	180	Not released.	Caroline Boetaker...	180	Not released.
Benjamin Westlake..	3,316	Released.	Benj. Westlake.	813	Released.
Archibald Donald....	1,917	Released.	Northern C. R. R. Co.	6,751	Released.
Jas. A. Cromwell.....	595	Not released.	Mrs. Jos. Palmer	876	Not released
Delos Richardson.....	432	Not released.	Richard Wilcox. ...	1,423	Released.
Emerson Orvis..	301	Not released.	James Ganoe	1,719	Not released.
Mrs. Dewitt C. Curtis.	1,083	Not released.			
Mrs. Jos. Palmer	876	Not released.			
Richard Wilcox	1,423	Released.	Dean's Bridge.		
James Ganoe.....	1,719	Not released.			
Total, 13,946 feet, of which 8,356 feet, or fifty-nine and nine-tenths per cent *is owned and released*; while 5,590 feet, or forty and one-tenth per cent, *is not released*.			Total, 13,946 feet, of which 10,617 feet or seventy-six and one-tenth per cent, *is owned and released*; while 3,329 feet, or twenty-three and nine-tenths per cent, *is not released*		

If the length of 1,700 feet of undrained canal prism owned by the Canal Railroad Company is deducted from the above table, we shall then have on the *east* side of the canal from the feeder to Dean's Bridge, 6,656 feet, or $54\frac{4}{10}$ per cent of the frontage *released*, while on the *west* side of the canal there is 8,987 feet, or $73\frac{4}{10}$ per cent of the frontage *released*.

Along the feeder, from the canal to the foot of the first lock, about 700 feet distant, there are only five abutting owners, two of whom have filed releases.

The foregoing list of adjacent property-owners was carefully prepared by Mr. Rickey, of Horseheads, in behalf of the local authorities, and is doubtless accurate enough for all practical purposes.

It will thus be seen that no further drainage than has already been accomplished on the northern area of the summit swamp is practicable unless a diversion of the waters is permitted, and that the drainage of the southern portion of the prism involved construction of the outlet through private lands. In the operations carried out last year, it was held that the intent of the act appropriating the sum of $6,000 for the sanitary drainage of the abandoned Chemung and Genesee Valley canals restricted all expenditures to the limits of State property, that is to say, that no work of drainage should be done outside of the "Blue line." Under this ruling, it is accordingly evident that nothing further can be done on the summit level under consideration, unless another act is passed by the Legislature making a new appro-

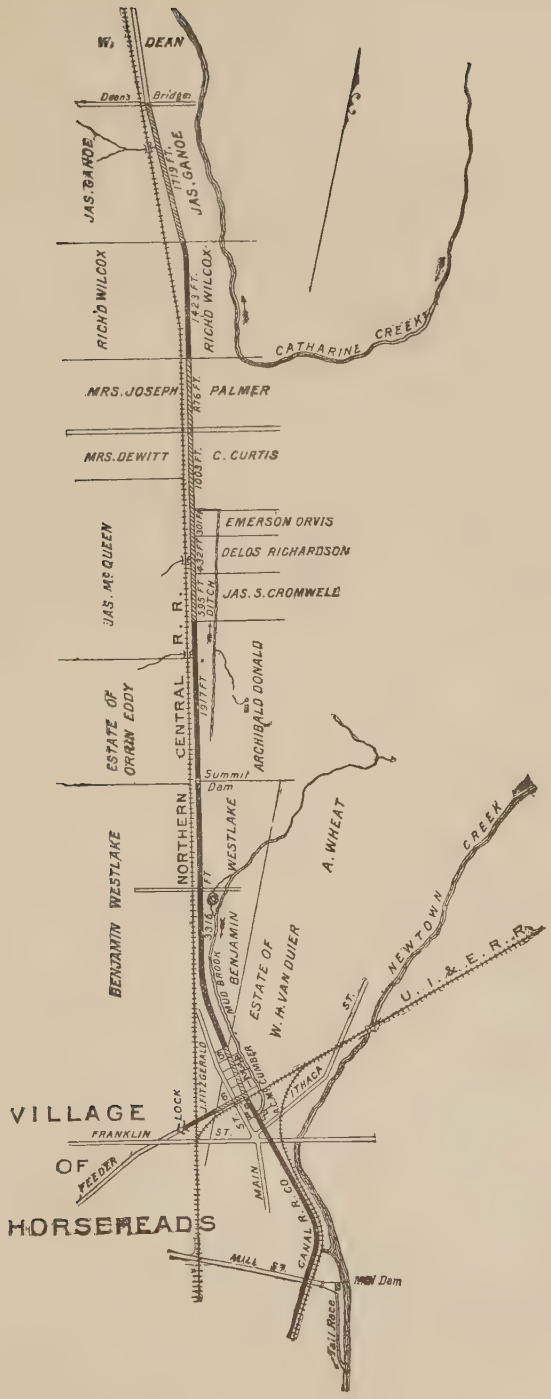
priation, and specially permitting the expenditure of a portion thereof in securing suitable outlet through private lands. It should also be remarked that in such an act provision should be made for the maintenance and care of the drainage works, as without proper attention they will soon fall into decay. Suitable restrictions concerning the manner of admitting the silt-laden water from lateral ditches through adjoining wet lands into the proposed main ditch are furthermore necessary, and the power to impose such conditions should, therefore, be vested in some proper authority. Numerous lateral ditches of this kind are now found entering the prism on both sides, particularly in the section from the summit dam to Dean's Bridge, and each of these inlets are plainly marked by the formation of a large bar composed of fine sand and muck — some of these bars being over 100 feet long and covering nearly the entire bottom of the prism to a depth of about one and one-half feet.

In conclusion permit me to say that I have not prepared any specifications to accompany this report, since such can best be made when a decision upon the matter under consideration has been reached. As soon as possible, the systematic drainage of the entire district should be undertaken in order to remove the malaria which arises from large tracts of swampy lands; and as such work is generally executed in accordance with the provisions of the Drainage Act, the State should obviously be prepared to assume its proper proportion of the necessary expense.

Respectfully submitted,

EMIL KUICHLING,

Civil Engineer.


W. DEAN
Deans Bridge
JAS. BARDE
JAS. GANOE
RICH'D WILCOX
RICHD WILCOX
CATHARINE CREEK
MRS. JOSEPH PALMER
MRS. DEWITT
C. CURTIS
EMERSON ORVIS
DELOS RICHARDSON
JAS. S. CROMWELL
JAS. Mc QUEEN
R. R.
CENTRAL
ESTATE OF ORRIN EDDY
ARCHIBALD DONALD
Summit
Dam
NORTHERN
WESTLAKE
A. WHEAT
BENJAMIN WESTLAKE
MUD BROOK
BENJAMIN
ESTATE OF W. H. VAN DUIER
NEWTOWN CREEK
U. I. & E. R. R.
ST.
FITZGERALD
LUMBER
ITHACA
LOCK
VILLAGE
FRANKLIN
ST.
OF
FEEDER
MAIN
HORSEHEADS
CANAL R. CO.
MILL ST.
Mill Dam
Tail Race

TABULAR STATEMENT OF PROPERTY OWNERS ABUTTING ON CHEMUNG CANAL FROM FEEDER TO DEAN'S BRIDGE.

I. *East side of Canal.*

	NAME OF ABUTTING OWNER.	Length in feet along canal.	Remarks.
1	Daniel Rockwell	190	Not released.
2	A. M. Palmer	98	Not released.
3	John Butcher	96	Not released.
4	A. C. Weston	100	Not released.
5	Caroline Boetaker	180	Not released.
6	Benjamin Westlake	3,316	Released.
7	Archibald Donald	1,917	Released.
8	James S. Cromwell	595	Not released.
9	Delos Richardson	432	Not released.
10	Emerson Orvis	301	Not released.
11	Mrs. Dewitt C. Curtis	1,003	Not released.
12	Mrs. Joseph Palmer	876	Not released.
13	Richard Wilcox	1,423	Released.
14	James Ganoe	1,719	Not released.

Total 12,246 feet, of which 6,656 feet, or $54\frac{4}{10}$ per cent, *is released*, and 5,590 feet, or $45\frac{6}{10}$ per cent, *is not released*.

II. *West side of Canal.*

	NAME OF ABUTTING OWNER.	Length in feet along canal.	Remarks.
1	Daniel Rockwell	190	Not released.
2	A. M. Palmer	98	Not released.
3	John Butcher	96	Not released.
4	A. C. Weston	100	Not released.
5	Caroline Boetaker	180	Not released.
6	Benjamin Westlake	813	Released.
7–11	Northern Central Railroad Co	6,751	Released.
12	Mrs. Joseph Palmer	876	Not released.
13	Richard Wilcox	1,423	Released.
14	James Ganoe	1,719	Not released.

Total 12,246 feet, of which 8,987 feet, or $73\frac{4}{10}$ per cent, *is released*, and 3,259 feet, or $26\frac{6}{10}$ per cent, *is not released*.

Property Owners on Feeder from Canal to First Lock, West.

III. *North side of Feeder.*

	NAME OF ABUTTING OWNER.	Length in feet along feeder.	Remarks.
1	Daniel Rockwell.....	.....	Not released.
2	W. L. Daily.....	285	Released.
3	John Fitzgerald.....	191	Unknown.

IV. *South side of Feeder.*

	NAME OF ABUTTING OWNER.	Length in feet along feeder.	Remarks.
1	Utica, Ithaca & Elmira Railroad Co..	516	Not released.
2	Bennett & Taber.....	243	Released.

REPORTS

ON POND NUISANCES IN WESTCHESTER COUNTY.

ROCHESTER, N. Y., *June 7*, 1883.

Dr. ELISHA HARRIS, Esq., *Secretary of State Board of Health:*

DEAR SIR — In the absence of Prof. Gardiner, the undersigned begs leave to transmit to you the following report of an examination of certain ponds in the town of Cortlandt, Westchester county, of which complaint has been made to your board. The examination was made on Friday, June 1, 1883, but owing to circumstances beyond my control, I have been unable to report earlier.

REPORT.

The principal complaint of the town board of health of Cortlandt refers to the condition of a small pond formed by a dam across a brook which flows through the village of Croton and empties into the Hudson river. This pond is situated within the village limits, and is surrounded by a number of dwellings, whose inmates are more or less afflicted with malaria. It belongs to the Van Wyck estate, and is maintained ostensibly for the purpose of obtaining in the winter season a supply of ice for domestic uses.

At the time of my inspection, there was a relatively large amount of water flowing in the brook, so that the pond was quite full, and covered an area of about one-third of an acre. In its lower portion, the water was from eight to ten feet deep, and the banks have a good slope; but in the upper portion the pond is very shallow, with muddy bottom and margins upon which a profuse growth of rushes and algae can justly be expected late in the season. This shallow area can be seen very plainly from the adjacent high banks, and occupies fully one-third of the whole area of the pond when full.

The dam which retains the water, however, is very loosely built of boulders and field stone, laid without mortar, and backed with a filling of earth and plank, through which there is considerable leakage. Accordingly, when the amount of water flowing in the brook and into the pond in seasons of drought is *less* than that which leaks through the dam, the water surface of the pond will be gradually lowered until the muddy bottom of the shallow portion is exposed to the sun, whereupon much of the aquatic vegetation will die and a development of malaria may begin. A slight shower suffices to fill the pond, on account of its small size, but the leakage and evaporation will soon again reduce the level of the water and expose the muddy

bottom and margins; and thus a constant oscillation of the water surface ensues, which is particularly favorable for the production of malaria.

It should also be mentioned that there are no other marshy places along the course of the brook in this vicinity, and that the sanitary condition of the dwellings where malaria occurs is pronounced satisfactory by the local board of health. The presumption, therefore, that the malaria is caused by the intermittent exposure of the muddy bottom and margins of the small ice pond appears to be well founded.

In view of these circumstances, I would accordingly recommend that the owner of the pond be required to make the dam thoroughly water-tight as soon as possible, so as to maintain a constant level of the water surface and prevent any exposure of the muddy bottom and sides; also that if said owner should elect to maintain the pond hereafter, *he be required to excavate*, at a proper season of the year, the accumulations of mud and silt now existing in the upper portion of the pond to such extent as *to preserve a depth of not less than two feet of water over the bottom*, and to cut the sides or margins of the basin to slopes as steep as may be found practicable. Another method of improvement may also be suggested in case that the owner should prefer to use the pond only in winter. This consists in providing the dam with a sluice way controlled by a suitable gate at the bottom, by which the water can be drawn off entirely early in the spring, and retained in the pond or reservoir at the beginning of winter. The sluice-way should, however, be of sufficient size to admit the free passage of any freshet which may occur in the interval during which the pond is abandoned for storage purposes; and the accumulation of mud and vegetable matter upon the bottom and sides should be removed, or be thoroughly ploughed under, or be covered with a thick layer of clean earth, at a proper season of the year as before.

Neither of these expedients are expensive, and if the work is properly directed, I think that the plan first suggested can be carried out at a cost of not more than fifty dollars, while the second would involve an expenditure of about one hundred dollars.

A complaint of earlier date, at Croton, refers to two small bayous on the Van Wyck estate, which have been cut off from the Hudson river by the embankment of the New York Central and Hudson River railroad, a short distance northerly from the railway station. From the statement made to me, however, it appears that an agreement has been effected between the owners of the premises and the railway company, whereby said bayous or pools are to be filled up with earth by said company; and as this work is at present in active progress, I infer that no further notice of the cause of the complaint need now be taken.

Respectfully submitted,

EMIL KUICHLING, *Civil Engineer.*

ROCHESTER, N. Y., *June* 8, 1883.

Dr. ELISHA HARRIS, Esq., *Secretary of the State Board of Health:*

DEAR SIR — In accordance with your request, I have the honor to transmit to you herewith the following report of an inspection of a

small swampy basin or swale situated upon the premises of Messrs. Cox and Barlow, in the eastern portion of the village of Croton, town of Cortlandt, Westchester county, said inspection having been made on June 1, 1883 :

REPORT.

The small natural basin or swale on the lands of Messrs. Cox and Barlow, and immediately in the rear of the Methodist church in the eastern part of the village of Croton, has been made the subject of complaint by the board of health of the town of Cortlandt, and its intermittent marshy condition is believed by them to contribute to the prevalence of malaria in that locality. An examination of the premises shows that the swale or depression referred to has an area of about one-third of an acre, and that it receives the surface drainage from the surrounding hill-sides, without adequate facilities for the removal thereof. On the western side of the swale a small drainage ditch has been constructed for the interception and removal of the waters coming from that direction, and the ditch is continued southerly to a natural water-course in the valley. Either from lack of sufficient depth in the outset, or else from want of proper maintenance, the bottom of this outlet ditch is now somewhat higher than the surface of the ground in the basin at its lowest points, and as the soil is largely composed of clay the drainage waters which find their way into the swale remain stagnant upon the bottom until they have been evaporated. In this manner the ground becomes saturated and swampy for a considerable period of time after every rain storm, and thus might readily give rise to the development of malaria to which the occupants of a number of dwellings in the immediate vicinity would then be subjected.

The remedy in this case is very simple, and consists merely in the enlargement and deepening of the present outlet ditch, and the construction of a suitable lateral ditch easterly across the swale, with one or two secondary ditches extending northerly to the margin of the wet area. All of these ditches should be cut with a grade of about one foot fall in two or three hundred feet of length, or with a steeper grade wherever practicable. If open ditches should be objected to by the owners of the premises, the excavations can be provided with stone or tile drains and then refilled. In either case the expense of this desirable improvement would be comparatively slight.

Respectfully submitted.

EMIL KUICHLING, *Civil Engineer.*

ROCHESTER, N. Y., *June* 11, 1883.

Dr. ELISHA HARRIS, Esq., *Secretary of State Board of Health :*

DEAR SIR — In the absence of Professor Gardiner, I have the honor to transmit to you the report of an inspection of a series of clay-pits situated a short distance easterly from the village of Croton, in the town of Cortlandt, Westchester county, said inspection having been made June 1, 1883.

REPORT.

In an elevated natural basin or depression south-easterly from the village of Croton, there is found an extensive and deep deposit of blue clay which, for a number of years past, has been utilized for the manufacture of brick at several brick works located on the bank of the Hudson river at and near Croton Landing. This basin is, however, the receptacle of the drainage waters from a large area of surrounding hill-side; and as some of the excavations made for the purpose of obtaining the valuable clay have now attained such depth as to be considerably lower than the present outlet for the drainage waters, and furthermore, as there are a number of higher and smaller pits scattered about in the locality without any provision for the removal of any water that may collect therein, it is feared by the town board of health that these clay-pits may become a source of malaria, and the advice of your Board is accordingly requested. The premises under consideration belong in part to Messrs. Cox and Barlow, and in part to the Van Wyck estate, and have been leased respectively to Geo. D. Arthur & Co., and to the Croton Landing Brick Manufacturing Company.

With regard to the danger of malaria from these excavations, I consider that the fears of the local health authorities are well founded, since any water which may find its way into such an undrained pit can be removed only by pumping or bailing on account of the impervious character of the soil, and if it is not thus removed, it will become stagnant and slowly evaporate, whereby conditions favorable for the development of disease are liable to ensue. * * *

The refilling of any abandoned and undrained pit with a porous material, such as common earth or loam, cannot be recommended because of the organic matter contained therein, which would be subjected alternately to saturation and dryness, and thus undergo retarded decomposition. Clean sand and gravel are much better adapted to this purpose on account of their freedom from substances of a perishable nature. It would, however, be more desirable to secure drainage from all such excavations before they are refilled, since the selection of the material will then not become a matter of so much importance.

* * * * *

With only a very few exceptions the excavations can readily be drained into the existing artificial outlet from the basin; and wherever such a working or pit has been abandoned, measures for its drainage should at once be taken. In the places where the clay is in process of being excavated, no serious danger can be apprehended in view of the mode of removal which is here practiced, and whereby it becomes necessary to pump out all water that has collected in the pit before any clay can be taken out; but if the method of removal by dredging should at any time be substituted in those pits which are deeper than the outlet for drainage waters, then danger from the stagnation of the water will follow, and it will, therefore, be advisable for the local board of health to exercise a careful supervision of the manner in which the clay is excavated.

It has already been stated that the complete drainage of the pits would be more desirable than their simple refilling with the most suitable material, such as clean sand or gravel. This will, however, become an expensive undertaking, since the present artificial outlet

channel has heretofore pierced the rocky rim of the large basin containing the clay, and a deepening of said outlet sufficient to drain the lowest pit as now existing would involve a correspondingly large amount of unprofitable excavation. I would, therefore, advise that the owners and lessees of the premises be notified of the danger to public health which is liable to result from lack of proper drainage of the pits, and that they be requested to submit to the local health authorities such plans and guarantees for the drainage or sanitary maintenance of the pits as may be acceptable. In consideration of the fact that the purposes of the said lessees and owners with respect to future operations in the locality are unknown to me, I am reluctant about indicating specific measures pertaining to drainage, and can accordingly deal with the problem only in general terms.

Respectfully submitted,

EMIL KUICHLING, *Civil Engineer.*

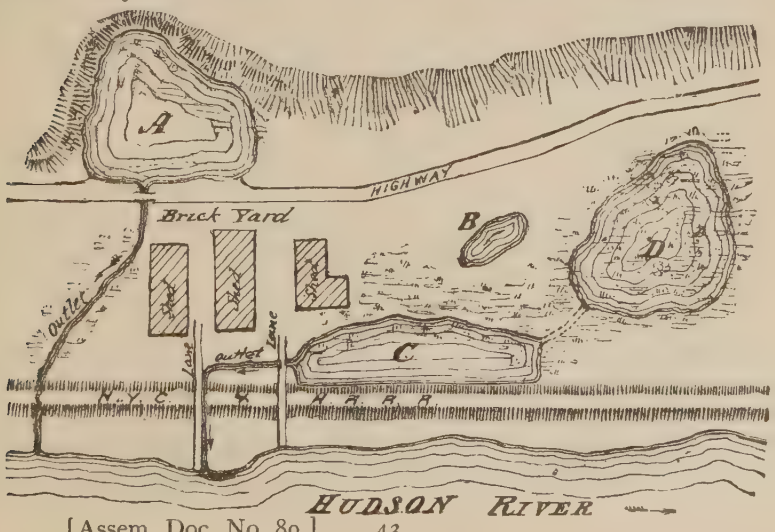
ROCHESTER, N. Y., *June* 18, 1883.

Dr. ELISHA HARRIS, Esq., *Secretary of State Board of Health:*

DEAR SIR—In the absence of Prof. Gardiner, the undersigned begs leave to transmit to you herewith the report of an inspection of certain ponds on the Van Cortlandt estate, adjoining the Hudson river in the town of Cortlandt, Westchester county, and a short distance south of the village of Croton; said inspection having been made at the request of the town board of health on June 1, 1883.

REPORT.

In the immediate vicinity of the brick yards on the Van Cortlandt estate near Croton Landing, a series of four ponds or pools of water are found, which are suspected by the board of health of the town of Cortlandt as being in an unsanitary condition and the source of malaria complained of by the residents. The location of these ponds relatively to each other and to the Hudson river is indicated upon the adjoining sketch or diagram, which is not drawn to scale from lack of time to make surveys of sufficient extent.



The first of the series is a large fresh water pond, marked A, which is fed by a number of springs in the bottom, and has an outlet through a small brook into the Hudson river. The upper end of this pond contains a large amount of aquatic vegetation, chiefly water lilies and kindred plants, with but few rushes and algæ; the lower portion, however, is clear and open, and the water is apparently of good quality. From the statements of persons well acquainted with the pond, it appears that there is little fluctuation of its water surface during the year, since its drainage area is quite limited and its supply is derived almost wholly from springs, whereby there is a constant flow of water in the outlet. The surface of the pond is a few feet above the level of high tide in the river, and its banks are in general quite abrupt, so that the amount of mud-margin is very small. At the time of my inspection the condition of the pond and its margins could not be pronounced unhealthy, and I can, therefore, express no further opinions concerning it until other examinations have been made. It ought, however, to be mentioned that one resident asserted that the water becomes covered in dry seasons with a greenish and offensive scum; but this statement is, on the other hand, flatly contradicted by others. The outlet brook is deficient in grade and has comparatively broad swampy margins, as shown upon the diagram; and I would, therefore, advise that its channel be suitably deepened and cleaned out so as to afford a ready escape for the overflow from the pond. Furthermore, to avoid complaint with regard to the formation of the scum referred to, it will be advisable to remove the accumulation of mud along the margins to a depth of about one foot below the ordinary level of the water, and to occasionally collect any scum that may form upon the pond, and cause it to be washed away into the river through the improved outlet channel.

The second pool is the one marked B, which is merely a small clay pit without any outlet and in which the surface drainage and subsoil water collects and becomes stagnant. This excavation is only about twenty feet long and ten feet wide, but it is said to be quite deep; and as water therein rises to the level of high tide in the river, drainage is impracticable. The pit should accordingly be refilled with clean sand or gravel, particularly in view of the fact that it has long since been abandoned as a source for obtaining clay, and no reason for keeping it open can be given.

The third and fourth pools are marked respectively C and D, and can fairly be regarded as sources of malaria. From the configuration of the ground and the testimony of old residents, it is obvious that said pools were once a part of the river and have been separated therefrom by the embankment of the N. Y. C. & H. R. R. R., as shown upon the diagram; but it is not claimed that any portion of the soil adjacent has been removed by the railroad company or by the brick-makers, or that said company did not provide a sufficient passage through its embankment for the escape of the drainage waters from said pools. An examination of the locality shows that the pool D is now a foul swamp, having an area of about one acre, and is connected with the pool C by a small channel, which has become badly obstructed. The pool C is about 250 feet long and about fifty feet wide, and is filled with a dense growth of algæ and other water weeds, from whose decay much annoyance can readily be expected. Instead of construct-

ing a direct outlet for this pool through the railroad embankment into the river, a ditch has been excavated along the foot of the slope of the embankment northerly to a lane leading from the brick yards under the tracks to the dock ; and the outflow from the pools is thus made to pass through said ditch and thence westerly along the south side of the lane or roadway into the river. At the beginning of said ditch, a timber and plank construction is found which evidently serves to retain the waters in the pool C, and prevent their outflow during ebb tide. It is also to be mentioned that the tide sets back into said pool C through the outlet ditch and causes the present water surface to fluctuate slightly, — this variation in level being only a few inches on account of the plank dam or bulk-head already referred to. The flat lands abjoining both pools C and D, are, moreover, quite swampy, although their surface is somewhat higher than the level of flood tide, thus indicating that the water comes from some higher source than the river.

In the interest of the public health, it becomes desirable to improve the condition of the locality by a proper system of drainage; and with that view I beg to submit the following recommendations:

First, the present outlet ditch of the pool C should be enlarged and deepened sufficiently to admit of draining said pool C to the lowest practicable level at ebb tide.

Second, at the junction of said ditch and pool, or at any other suitable point in the course of said ditch, a swinging tidal gate should be constructed by which the tide will be excluded from the pool, and the water which may accumulate in the pool during flood tide can escape when the tide has run out.

Third, the bottom of the pool C should be refilled and graded, if the conditions require such work, so that no point thereof shall be lower than the bottom of the opening controlled by the swinging tidal gate, and that no water shall remain stagnant thereupon when the tide is at ebb.

Fourth, the ditch connecting the two pools C and D should be enlarged and deepened so as to drain the latter pool to as low a level as practicable into the improved bed of the former pool; and if by such drainage any places be found in D which are lower than the bottom of said ditch, then all such depressions should be filled in with a gravelly and clayey soil.

Fifth, to render the swampy margins of the pools and the saturated lands adjacent thereto dry and healthy, a sufficient number of open or covered drains should be made in said wet lands and conducted into the improved pools so that the water which now remains in and upon the soil can find an outlet into the river at low tide.

Respectfully submitted,
EMIL KUICHLING, *Civil Engineer.*

Pond Nuisances at Arlington, Dutchess County, New York.

September 29, 1883.

Dr. Elisha Harris, *Secretary of State Board of Health :*

Dear Sir — The town board of health of the town of Pougheepsie, Dutchess county, from numerous complaints made by the inhabitants of Arlington in said town of the foul and noxious smell emanating

from two small natural ponds (having no outlet in dry times) in the said place, having been called together by the supervisor of said town to examine said ponds or stagnant pools, proceeded to examine them. The board found the ponds or pools partially filled with fœtid stagnant water, covered with a green scum particularly noxious. And said board after hearing the evidence of the people and examining the certificates of physicians did pronounce said ponds or pools a public nuisance and detrimental to the public health of the neighborhood and ordered them abated. The proper notices were served upon the owners of said ponds, to abate the said nuisance. And they having refused compliance with said orders, the town board of health through its agents are doing the work.

Now the *question* is, are the owners liable for the expense of draining said ponds or pools?

By answering the above you will oblige the board of health of said town.

Respectfully yours,
JOHN H. OLLIVETT,
Justice of the Peace.

October 6, 1883

Dr. HARRIS, *Secretary of State Board of Health:*

DEAR SIR — Yours of the 2d instant was duly and thankfully received, and I hope you will excuse me for presuming to again trespass upon your time. Myself and colleagues wish to do our *whole duty*, and to be certain that we are correct is my excuse for again trespassing upon your time. In my communication of the 1st inst., I stated all of the case that I deemed necessary, but as you expressed a regret that we did not give the owners a hearing, I will again state the whole case — showing that we did give them a hearing.

Owing to the complaints of inhabitants of Arlington, town of Poughkeepsie, Dutchess county, of certain, small *natural* stagnant pools or ponds in that vicinity, causing various malarial diseases, the board of health of said town was convened, by order of the supervisor, for the purpose of investigating the condition of said ponds; they after examining said ponds, and hearing the evidence of the inhabitants and the certificate of physicians, declared said ponds to be a nuisance, detrimental to the public health of the neighborhood, and ordered the owners thereof to abate the said nuisance or commence the abatement thereof within five days from the date of the order. The board at the same time appointed myself with two more of its members to see, in case of non-compliance, that their orders were executed, and further order me, to serve said *orders* on the owners and if necessary to employ counsel, etc., etc. I accordingly served the *written notices* on said owners and orally requested them to meet the committee of the board on a certain day named, to hear the reasons why the owners should not abate said nuisance. They met with said committee according to *oral notice*, but did not dispute the question as to the ponds being a nuisance, but claimed the owners were not responsible for the nuisance as they had no hand in creating them,

and as the ponds were *natural hollows* or *pools* the *law* did not require the owners to drain or abate them. The board then with the owners of *one* of the ponds submitted to I. F. Barnard, Supreme Court judge, the question I put to you in my note of the 1st inst. "Are the owners of these natural ponds holden for the expenses of draining them?"

We presented to his honor the law as amended and passed in 1882, and the decisions as laid down in Wood on Nuisance and others. As you will see noted in his *finding* or decision, a copy of which is inclosed, the judge decided that the owners were not responsible as the board of health did not have the power to make the order.

It was agreed and understood by all the parties that the judge's decision need not be final or binding and that no one need be bound by the decision, they the owners having previously *refused compliance* with the orders of the board. The board wished the decision thinking that they had acted within the proper scope of their authority, and wished to avoid any trouble — supposing that the law was perfectly plain on the subject. The work of abating said nuisance is being done by orders of the board of health and is now nearly complete. The board claim, and propose to compel the owners to pay the expenses of said work, provided we in your opinion are correct in our proceedings. I have now stated the whole case and all the proceedings up to date. And if you will please answer, saying whether we are correct or not, you will greatly oblige the board of health of the town of Poughkeepsie.

Yours respectfully,

JOHN F. OLLIVETT,
Member of Board of Health.

The following is a copy of Barnard's decision:

BARNARD, J. — "The only power given by the Legislature to boards of health affecting the question proposed is the power of suppressing and removing of nuisances detrimental to the public health, chapter 351, sections 1, 2, 3 and 6, Laws of 1882. An entirely natural pond is not a nuisance. 17 Barb. 224; Wood on Nuisances, page 118. No one can be indicted for owning such ponds. A person must create a nuisance or maintain one so created, after notice to abate it, to be liable for a nuisance. It is competent for the Legislature to take lands by the existence of the right of eminent domain, and drain them for public health; the land must then be paid for on the damage done. The board of health did not, therefore, have the power to make the order.

POUGHKEEPSIE, *August* 22, 1883.

ELISHA HARRIS, Esq., *Secretary of State Board of Health:*

DEAR SIR — Yours of the 16th inst. was received and read before the board at a regular meeting held August 21, and I was instructed to communicate with you and inform you what action had been taken by this board in regard to the Pelton pond nuisance, also to ask, as you suggested, that a committee with engineer from State Board of Health meet with board of this place at such time as most convenient to member or members of State Board.

If notified in time a special meeting of the board will be called so that we can meet the committee at depot at this place.

A complaint was received in regard to the pond, June 19, and was referred to a committee of five to report at next meeting, July 22.

The committee reported substantially the same as reported to you, in communication from a gentleman of this city, and the secretary was instructed to serve a notice on the owners of the pond to have the nuisance abated, by having the pond cleaned as soon as practicable.

It was not thought advisable to disturb the pond until cold weather.

I would say, as yet, that I have not been able to serve the notice and it seems impossible to find the owners.

The city attorney, Mr. W. M. Lee, has been endeavoring to find who are the owners, and who are responsible for the nuisance, but up to the present time has been unable to do so.

Inclosed will find an extract from morning paper and perhaps it will enable you to see how the matter now stands.

It is the opinion of a majority of the board of health of this place that the only practical way to remove the nuisance is to remove the dam, wall up the pond and make it a running stream. It is the only mill pond in the city.

Please let me know as soon as convenient at what time we may expect the committee, and oblige.

Yours very respectfully,

WILLIAM SCOTT, *Secretary.*

ALBANY, *September 7*, 1883.

Dr. ELISHA HARRIS, *Secretary of the State Board of Health:*

DEAR SIR — After an inspection of the Falkill creek and Pelton pond, in the city of Poughkeepsie, made August 30, in company with the Hon. Erastus Brooks, of your Board, and later in the day with Mr. Chas. E. Fowler, C. E., superintendent of the water-works of that city, I have the honor to report the following:

Falkill creek is a stream emptying into the Hudson a short distance north of the Hudson River railroad depot, and extending eastward several miles beyond the city limits. Its course is sinuous through the city, and extends nearly three miles therein. Prior to the year 1873, the stream existed as a natural water-course, with depressed areas widening at various points into ponds, Pelton pond being the last of a series of such water areas. The stream then received the surface drainage of the contiguous streets, houses and lots, and it became a receptacle for more or less garbage and deleterious waste matter. The mill ponds were practically silting basins in times of freshet, and nuisances in periods of drought. The local water board, under plans prepared by J. B. G. Rand, C. E., undertook and carried out the plans and recommendations, except in the instance of Pelton pond. (See extract appended.) These plans consisted in establishing a grade for the bed of the creek, the obliteration of the ponds thereon, the confinement of its waters to an adequate walled channel; the construction of intercepting lateral sewers; the disposal of all deleterious drainage without the walled channel, and a strict prohibition as to the disposal of waste matter, organic or otherwise, within or into such creek bed.

Instead of projecting this improvement through Pelton pond, as originally contemplated, a compromise was made to pacify interests conflicting with such a course, and the result is seen in Pelton pond as it now exists, curtailed of its original area, and existing as a receptacle for the accumulated wash and silt of several miles of water-shed. (*Vide* extract from Poughkeepsie Water Board report appended.) Existing prohibitory laws, and a strict surveillance by the local agent of the board of health do not entirely prevent waste matter, tin cans and ashes from being thrown into the stream, as an inspection of the surface silt in Pelton pond will show. This improvement stopped at the easterly end of Pelton pond; the original area of the pond was decreased one-half or more, and a dry rubble retaining wall constructed, as at present defined, the area *without* being filled up to the top of the walls with earth. The water board not being responsible for the *maintenance* of the pond, and the mill-owners *controlling* the supply to their mills and the gate at the dam; the result has been that since 1873 the pond has not been cleaned, and there is at present an accumulation of ten years of silt. There are several leaks in the dam, which permit all the water at this time to escape, and the mud bottom is exposed to the sun over the greater portion of the pond area. For lack of moisture the vegetable growths (algæ and water-lily pads principally) are drying up and cause quite an offensive effluvium. At the inlet of the pond, the silt, composed largely of the coarser material brought down by the stream in periods of freshet, consists of small stones, gravel and sand; this gradually changes to earthy silt and then to fine alluvium. Test pits made a few feet from the northerly shore line showed a depth of two feet of black, earthy, semi-decomposed vegetable matter, containing a large amount of gas, set free at the least motion of the shovel. The retaining wall is also partially demolished.

The dam, on inspection, was found to be imperfectly constructed, and five important leaks waste the entire supply as at present furnished by the stream (August 30, 1883). Repairs to the dam cannot be readily made without depleting the pond, removing the silt and practically reconstructing the footing of the dam.

To maintain Pelton pond in a manner consistent with the interests of the city, and not as an eye-sore, a nuisance, and as an element detrimental to the health of contiguous property holders, is a problem that necessitates the following conditions:

1. A constant and adequate water supply.
2. A perfect, water-tight dam.
3. Periodical scour in times of freshet.
4. Periodical (yearly) removal of the silt.
5. A cleanly condition of the marginal lines.
6. A depth (constant) of three feet of water.
7. The constant inspection and maintenance by a competent authorized agent of the city.

These specifications, I fear, cannot be secured with a variable and inadequate supply, as shown by the stream at this date, subject as it is to the arbitrary demands of the mills claiming the usufruct of the stream, and the control of the gate at the dam. A *temporary* relief, as soon as hard frost appears, can be secured by depleting the pond,

removing the silt and repairing the dam, but such a course, in the face of interests that conflict with a proper maintenance of the above conditions, is at best but *temporary*.

I therefore recommend, as a permanent and substantial remedy to existing and future defects, if a temporizing policy is thought of, that the original plan of extending an open walled conduit from "B" to "A" (as shown on the tracing of the locality complained of, showing Pelton pond and a portion of the Falkill creek, herewith submitted), be adhered to and carried out, and that all that portion of the pond area lying without the limits of the walled conduit so constructed, be filled up to the established grade of the retaining walls with wholesome earth. If necessary, proper facility being offered the mill at "A" to take such water as would naturally run to waste in periods of freshet or when the stream is high.

Appended is a copy of an extract from the report of the Poughkeepsie Water Board, dated February, 1872, in relation to the action heretofore alluded to in this report, and the reason for such action. Also a tracing of the original area of Pelton pond, its present area, and the location of the proposed conduit through the pond.

All of which is respectfully submitted,

WM. T. EDGERTON, *C. E.*

EXTRACT FROM REPORT OF THE WATER COMMISSIONERS OF POUGHKEEPSIE, DATED FEBRUARY, 1872.

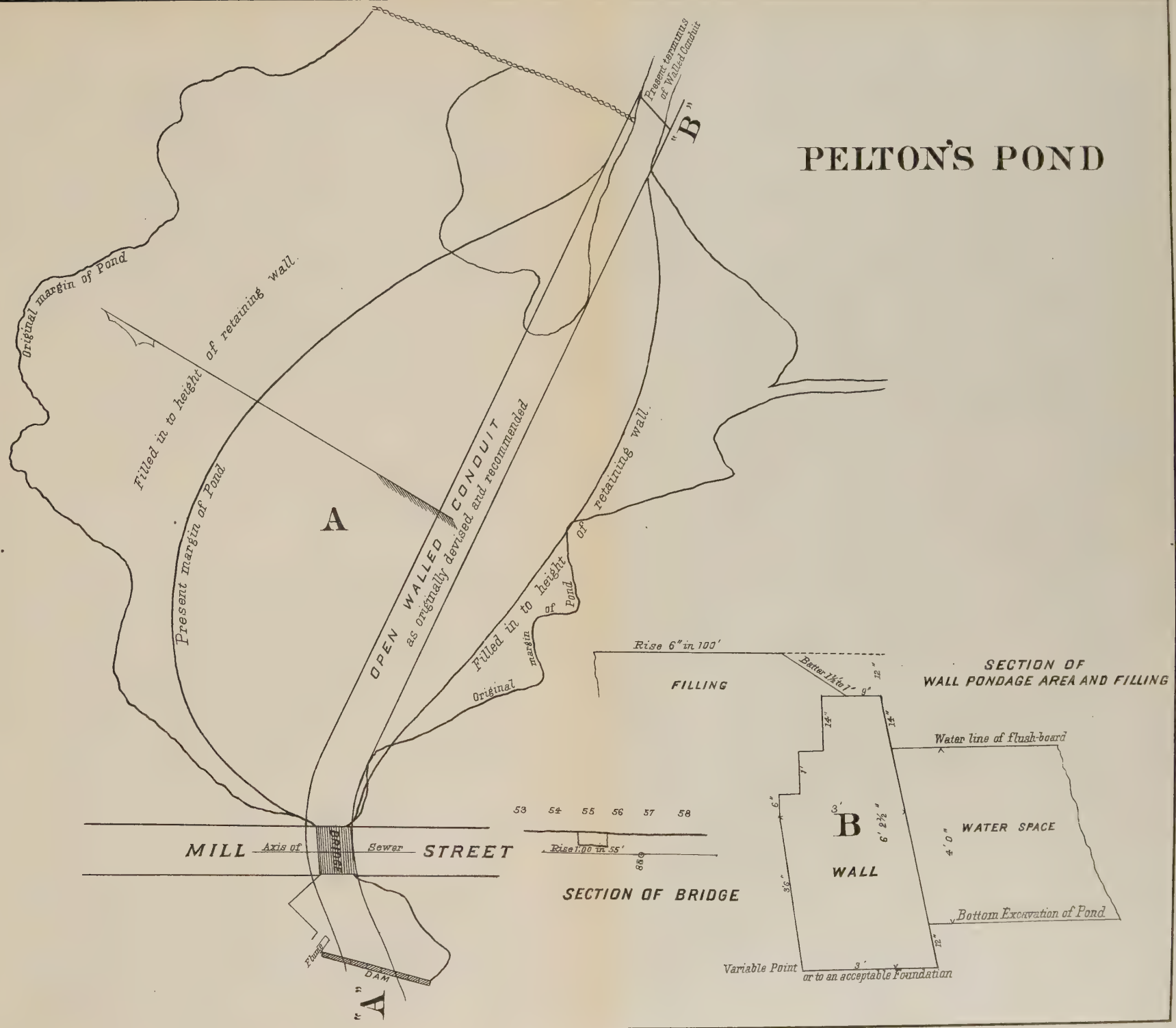
"*Ponds.*— Public sentiment seemed to indicate that the ponds were the cause of much sickness in the city, and in obedience to this sentiment and in conformity with the convictions of the board, it was decided to be the duty of the board to remove them. Failing to agree with the owners upon the amount of damages, application was made to the Supreme Court for a commission to fix them. The commission sat, heard the testimony on both sides, and awarded to Messrs. Pelton, $40,000; to Charles Swift, $6,000; to John C. Parker, $16,000; to the Poughkeepsie Ice Co., $400; to the Messrs. Lent, $19,000; to Messrs. Boyd and Wiltsie, $1,800. The awards were accepted, with the single exception of that of the Messrs. Peltons, which in the judgment of the board was excessive, and was accordingly rejected by the board.

Pelton pond.— After some delay an arrangement was effected with the Messrs. Pelton and the mill-owners below, namely Messrs. Irwin & Co., and Messrs. Arnold & Co., by which the pond was to be reduced in size, the shallowest parts filled and the new pondage area deepened, so that not less than two feet of water shall at all times cover the bottom, the borders walled -- the Messrs. Pelton to receive $15,000, which has been paid; the mill-owners below to receive no compensation."

To His Excellency the Governor of the State of New York:

We, the undersigned board of health of the town of Rhinebeck, Dutchess county, N. Y., respectfully present the following facts and petition based thereon:

Complaint having been made of the condition of the cove of the Hudson river, near State dock in this town, traversed by the New York Central and Hudson River railroad and the Hartford and Con-


PELTON'S POND
Present terminus of Walled Conduit
"B"
Original margin of Pond
Filled in to height of retaining wall.
Present margin of Pond
A
OPEN WALLED CONDUIT
as originally devised and recommended
Filled in to height of retaining wall.
Original margin of Pond
Rise 6" in 100'
FILLING
Batter 1¼ to 1'
SECTION OF
WALL PONDAGE AREA AND FILLING
Water line of flush-board
B
WALL
WATER SPACE
Bottom Excavation of Pond
Variable Point
or to an acceptable Foundation
MILL STREET
Axis of Sewer
Culvert
53 54 55 56 57 58
Rise 1.00 in 55'
SECTION OF BRIDGE
Flume
DAM
"A"

necticut Western railroad, after investigation and report by the health officer, it was ordered by this board, July 10, 1883, that said corporation construct culverts through their respective roads, at points designated in the order. No attention was paid to this order. Subsequently five members of this board, together, made personal examination of said cove, and at a meeting held thereafter, unanimously reissued the order as above, and directed that the work be done by October 1, 1883. Said order was properly served upon each of the aforesaid corporations ; this order has been totally disregarded. The local board has exhausted its resources. We, therefore, most respectfully request his Excellency the Governor will require the State Board of Health to investigate this matter, to the end that an important and necessary sanitary measure may be enforced.

N. J. ODELL, *Supervisor.*
JACOB H. POTTENBURGH, *Town Clerk.*
THOS. GILLENDER, } *Justices of the Peace.*
WM. H. HEVENOR, }
C. S. VAN ETTEN, M. D., *Health Officer.*

Dated Rhinebeck, *October* 25, 1883.

Report on the Unhealthful Condition of Coves near Rhinebeck, Cut off by Hudson River Railroad Embankment.

It is a popular impression that the embankment of the Hudson River railroad cutting off, as it does, many shallow coves from full and open connection with the main current, has acted as the principal cause in producing malaria along the east bank of the river.

While medical records show that malarial fever has prevailed to a greater or less extent in some localities along the Hudson for the past hundred years, and that, therefore, the building of the railroad along the banks of the river cannot have been the only condition favoring the development of this disease, it is yet true that in certain places the building of the embankment has induced those conditions which favor the production of malaria. In other places the railroad embankment has undoubtedly improved the character of the shore, covering up and filling in shallow margins, that would have exposed muddy places to the action of the sun at low tides.

Half a mile north of the station at Rhinebeck, the Hudson River railroad embankment cuts off from the main channel of that river a narrow cove, some 2,800 feet long; the narrower part of this cove is from 200 to 300 feet wide, the broader part was originally some 600 feet broad. The water is from four to six feet deep through the greater part of its area at high tide.

Before the construction of the railroad this cove was cut in two by a road built out from the shore to the State dock, as it was called, which lies outside the river embankment, and is now built upon by the Knickerbocker Ice Company. This road, running out from the shore to the dock of the ice company, divides the long cove into two parts, the northern one being 1,500 feet long by 200 to 300 feet broad,

and the southern one 1,300 feet long by 600 feet broad in the widest places. These two parts are connected by a double culvert through the road that divides the north and south half of the cove.

The Hudson River railroad constructed a culvert, of about twelve feet wide, through their embankment, some 400 feet north of the State dock, and opening into the northern half of the cove.

It was supposed that this single culvert would admit of sufficient in-and-out flow of the tide to freshen the water in a cove more than half a mile long, the water reaching the south half of the cove by passing through a second culvert in the road, or causeway, opposite the State dock.

A few years ago the Hartford and Connecticut Western railroad built an embankment, running nearly north and south, across the south-eastern corner of the southern half of the large cove, thus making an inner cove, lying east of the embankment of the Hartford and Connecticut Western Railroad Company. They built a small culvert through their embankment, with a view of admitting a flow of water from the main cove into the one which they had thus made.

It appears, therefore, that what was originally one cove is now divided into three. The water of the river is admitted into the northern cove, flows thence through a culvert in the causeway into the southern cove, thence through the culvert under the Hartford and Connecticut Western railroad embankment into the innermost or eastern cove.

There are a number of dwellings along the shores of the cove and within 1,500 feet of the bank. The health officer of Rhinebeck informs us that malaria occurs in all these houses.

The chairman of the committee of the State Board of Health, on examining the ground, found the culvert leading into the inner cove broken down and filled up, so as to admit the flow of only a little water. The local board of health complained that in the inner cove, east of the Hartford and Connecticut Western Railroad Company's embankment, and in the southern half of the large cove, especially toward its southern end, there is in summer a rank growth of vegetation, the decay of which causes offensive emanations likely to produce disease.

At the time when the chairman of your committee made his inspection the frosts had already killed this vegetation ; but it was perfectly apparent that the amount of water entering the southern half of the large cove was not sufficient in its outflow to carry off accumulations of dead vegetation from the southern end of the large cove, and that the outflow from the eastern cove behind the Hartford and Connecticut Western railroad embankment was by no means sufficient to prevent dead vegetable matter from accumulating in it.

While it is true that water plants grow where there are currents, and that, therefore, currents will not prevent altogether the production of vegetation, a full and free outflow of water from places where vegetation is growing will carry away decaying vegetable matter and thus prevent its accumulation.

It is this accumulation of decaying matter which causes the smells complained of. Such a condition cannot but be unwholesome and tend to produce malarial disease in its neighborhood. It is a noticeable fact that while malaria prevails in all of the dwellings immediately

around this cove, where decaying vegetation accumulates in the summer, the disease is confined to comparatively few dwellings in the little hamlet which lies half a mile south, immediately about the railroad station, where the river bank is steep and no cove exists inside of the railroad embankment.

The local board have requested the Hudson River railroad and the Hartford and Connecticut Western Railroad Company to open new culverts through their embankments to admit of a larger flow of water to the southern and eastern coves. No attention having been paid to this desire of the local board of health, they have appealed for redress to the Governor of the State, who has referred the matter to the State Board of Health.

The chairman of your committee has examined the grounds which are represented on the accompanying chart, and your committee are of the opinion that in order to secure a circulation of water in the southern and eastern coves, it will be necessary to open a culvert not less than ten feet broad through the Hudson River railroad embankment as near as practicable to the southern end of the cove, and also to construct a culvert not less than four feet wide through the bank of the Hartford and Connecticut Western Railroad Company into the eastern or innermost cove.

We recommend that the two railroad companies above named be requested by the State Board of Health to build such culverts through their respective embankments as early as possible in the spring. We feel little doubt that the reasonableness of this request will be so apparent to the managers of these corporations that it will not be necessary to invoke the power of the executive order from the Governor requiring execution of the work.

Respectfully submitted,

JAMES T. GARDINER, *Chairman.*
ERASTUS BROOKS.
EDWARD M. MOORE, *President.*
ELISHA HARRIS, *Secretary.*

Committee on Drainage, Sewerage and Topography.

At the quarterly meeting, held November 21, 1883, the above report was submitted, and it was unanimously ordered that the report is approved and adopted, and that a copy be transmitted to the Governor, to the town board of health of Rhinebeck, to the New York Central and Hudson River Railroad Company, and to the Hartford and Connecticut Western Railroad Company; also that the report be given to the press.

A true copy.

[L. S.] E. HARRIS, *Secretary.*

No. 1.

HARTLAND NUISANCE — PETITION AND OTHER PAPERS, 1883, UNDER CHAPTER 291, 1883.

CHAPTER 291.—An Act to provide for the prevention of disease or sickness caused by the overflow or discharge of water from the canals of the State into creeks or water channels.

PASSED April 23, 1883; three-fifths being present.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

SECTION 1. Whenever water escaping or discharged from any of the canals of this State through water-gates, spill-ways or otherwise shall overflow lands located along the canals, or any creek or stream receiving such water, or collect in stagnant pools along the canal or any such creek or stream to such an extent as to cause disease and sickness to the inhabitants of the vicinity, any three residents of the vicinity may make complaint thereof in writing, under oath, to the State Board of Health, setting forth the extent of the injury to the public health so far as is within their knowledge, and the length of time the disease or sickness has existed, which complaint shall be verified and shall be accompanied by a certificate of a practicing physician residing in the vicinity, stating the facts pertaining to the allegations of the complaint, so far as known to him.

§ 2. On receiving such complaint the State Board of Health shall forthwith examine into the facts and circumstances therein set forth, and may call on the State Engineer and Surveyor to make such surveys as they may require for their information, who shall render such assistance without delay, and in case such board shall be satisfied that such disease or sickness exists, and is caused by waters of the canal escaping or discharged therefrom, said board shall report regarding the matter to the Superintendent of Public Works without unnecessary delay, who shall forthwith abate the cause of such disease or sickness complained of.

§ 3. Fifteen thousand dollars is hereby appropriated out of any funds in the treasury not otherwise appropriated, to be paid by the treasurer on the warrant of the comptroller, which warrant shall issue upon the orders from time to time of the Superintendent of Public Works, which moneys, or so much thereof as may be required, shall be expended by him in performing the work required by this act to be done.

§ 4. This act shall take effect immediately.

Albany, *May* 4, 1883.

To Dr. E. M. Moore, *President Board of Health*, and Emil Kuichling, *Civil Engineer:*

Gentlemen — Please take notice of the inclosed complaint, which was duly made and attested several weeks ago by the board of health of Hartland, Niagara county.

This complaint, considered under chapter 291 of the Laws of 1883, you will observe is a sufficient basis for the action which is now requested from all the members of the Legislature, representing the district in which Hartland is situated. A new complaint and more recent medical evidence may be submitted to this board within the next ensuing ten days, yet, acting under the urgent request of the three honorable gentlemen above mentioned, and in response to the annexed complaint, this board will, upon the written approval of its president, proceed to a preliminary inspection and general survey immediately. For this purpose, it is deemed expedient that a preliminary report should be submitted at the quarterly meeting to be held on the 9th inst., which will indicate what request the board should make to the State Engineer, as provided in section 2 of said chapter 291.

For this preliminary inspection, and the preparation of a memorandum for the meeting next Wednesday, this duty is wholly committed to you, and upon the president's indorsement upon this note, this preparatory work is to be regarded as ordered by the board.

As the canal is to be opened, and will doubtless be overflowing in Hartland on the 9th inst., it is desirable that observation should begin on Saturday the 5th or Monday the 7th instant.

Please preserve this original copy of the complaint, and I will exchange a new complaint for it, within the next ten days.

Respectfully,

[L. S.] ELISHA HARRIS, *Secretary.*

Acting for committee on drainage, sewerage and topography

As president of the board and a member of its standing committee on drainage, etc., I hereby approve the proposed procedure for the preliminary inspection, etc., by Emil Kuichling, Civil Engineer.

E. M. MOORE, *President.*

To the Secretary of the State Board of Health:

Dear Sir — We hereby make the following report:

First. That the east branch of the Eighteen-mile creek, in its original state, would after the spring floods become dry, to the extent of carrying off all the water coming down the creek, except in the time of freshets, and soon after would pass off the lowlands adjoining the creek, so that grass and crops were grown thereon.

Second. In 1840 the State enlarged the waste-weir on the canal, letting water into the east branch of the Eighteen-mile creek, so that the water overflowed the banks of the creek. In 1842 the inhabitants cleaned out the creek so there was no stagnant water lying upon the land.

Third. After the enlargement of the canal and waste-weir, there occurred several breaks of canal banks, culverts and waste-weirs that

carried the debris and dirt down the creek so as to make bars across the creek, that dams the water to such degree as to overflow the bottom lands adjoining the creek.

Fourth. The bottom lands are fertile, but are covered the greater part of the season with stagnant water to the extent of several hundred acres, on which are grown wild grass and flags which, with the rise and fall of water, produces in hot weather decayed vegetable matter, from which arises an offensive stench, which extends to the dwellings of the inhabitants and highways. And from a canvass made in 1881, by F. L. Knapp and G. W. Chaplin, of each family living along the creek, of the number of sick in their families in different years from malarial diseases arising from the creek, as told them by the physicians, amounting in the aggregate to several hundred cases, some years more than others, but every year has its victims.

Fifth. As the banks all along the creek are from six to eight feet higher than the bottom of the creek in its original state, and as there is no water above the waste-weir in the summer months, it is self-evident that the State in letting off water into the Eighteen-mile creek is the source of the water supply and nuisance, and by its courts have declared that the channel of the creek is the property of the State, and its use lawful, and the State does exercise and control the water-course.

Sixth. We, therefore, respectfully ask of the State Board of Health assistance and aid in the removal and abatement of the nuisance.

Dated this 11th day of January, 1883.

JAMES ALLEN, *Supervisor.*
ESEK ALDRICH, *Cit. Mem.*
GORDON ROWE, *Justice of the Peace.*
CHAS. A. KENDALL, *Town Clerk.*
JNO. H. MATTESON, *Justice of the Peace.*
SOLOMON RICHARDSON, *Justice of the Peace.*

ROCHESTER, N. Y., *May* 19, 1883.

Dr. ELISHA HARRIS, Esq., *Secretary of State Board of Health:*

DEAR SIR — In the absence of Prof. Gardiner, the undersigned begs leave to transmit to you the following report of a preliminary examination of that portion of the east branch of the Eighteen-mile creek which flows through the town of Hartland, Niagara county, and which is complained of as habitually overflowing its banks in consequence of waste water from the Erie canal. This examination was made on Wednesday, May 9, 1883, or two days after the formal opening of canal navigation, in company with the members of the Hartland board of health and several interested citizens of said town.

REPORT.

For a number of years past, much complaint has been made by the residents of the town of Hartland along the course of the small stream known as the east branch of the "Eighteen-mile creek," with respect to the constant flooding of the low lands adjoining said stream with water drawn from the Erie canal, and also with respect to the malaria

pervading the locality as the result of such floodings. Relief has repeatedly been sought from the State authorities, but owing to the lack of means which could be legally devoted to this purpose, all previous efforts to secure an amelioration of the district have been ineffectual. During the session of the Legislature which has recently terminated, however, an act, entitled *chapter* 291, *Laws of* 1883, "to provide for the prevention of disease or sickness caused by the overflow or discharge of water from the canals of the State into creeks or water channels," was passed, whereby it becomes the duty of your board to examine into the facts and circumstances of such complaints and report thereupon to the Superintendent of Public Works, "who shall forthwith abate the cause of such sickness or disease complained of;" and in accordance with the provisions of said act, an examination of the locality was duly made by the undersigned upon the request of your Board on the date above mentioned.

The east branch of the Eighteen-mile creek rises in the high lands of the town of Royalton, a few miles south of the Erie canal, and flows thence in a northerly direction into the town of Hartland, where it makes a sharp turn and takes a westerly course to its junction with the west branch of the creek in the adjoining town of Newfane. In Royalton the creek has worn a deep channel through the surface soil and the softer strata of limestone, so that in this town no complaint is made except for a short distance near the northern boundary, where the creek enters a lower terrace, which is comparatively level, and through which the stream winds sluggishly for several miles. The creek is carried under the embankments of the New York Central and Hudson River Railroad and Erie canal through large stone culverts, and on the berme of the canal a spill-way and waste-gates have been constructed with a suitable outlet channel into the creek, as shown upon the accompanying map. A short distance north of the canal, the creek falls over two separate ledges of rock, which afforded excellent sites for the development of water-power, and at which dams have been built for increasing the natural fall of the water and furnishing power to two flouring mills. At the time that these mills were first erected, the stream appears to have yielded a continuous and sufficient supply of water throughout the year, independent of any waste-water from the canal; but as the country became cleared up and drained, the volume of the stream was gradually reduced in dry seasons, until now the supply for the mills during the summer is almost entirely derived from the canal either in the form of an occasional overflow from the *spill-way*, or else, as is generally the case, in the form of leakage or positive out-flow from one or more of the five *waste-gates* which are located in the structure on the level of the bottom of the canal. From the evidence presented to me by the residents, it seems that the natural flow of the creek during the period from May to November has been very slight for a number of years past, and that a sufficient amount of water to operate the mills is almost constantly being wasted from the canal into the creek during the season of navigation. In proof of this assertion, the facts that the mills are almost constantly in operation by water-power, and that little or no water is flowing in the creek immediately above and below the railroad culvert, are adduced, together with ample evidence of the escape of large quantities of water from the canal through or over the waste-weir structure.

But in its course through the town of Hartland, the creek flows in a broad depression of the surface which has comparatively little descent in the direction of the stream, and along which there are many low places that have undoubtedly always been swampy, as the soil is a deep, black muck or peat. This fact is not denied by the residents; but it is argued that in view of the great decrease in the *natural flow* of the creek, all of the marshy lands would either become dry by evaporation during the spring and early summer months, or else that said lands could easily be drained into the present channel, so that no malaria would arise therefrom and that they could be utilized profitably by their owners. With regard to the natural floods which came down the stream in spring, it is asserted that such can produce no serious injury to the public health as the ground is then generally frozen, and also as the freshets have only a very brief duration. Severe rainstorms during the summer produce little effect upon the creek, as nearly all of the rainfall is said to be absorbed by the cultivated fields which constitute substantially the whole of the drainage area. As to the ordinary *overflow* from the *spill-way*, no complaint is made by the residents along the creek, since this is usually small in amount and can readily be controlled by the agents of the canal department at Lockport so as to reduce it to a minimum, but they object strenuously to the escape of water from the *waste-gates at the bottom of the canal* into the creek in quantities so large as to furnish ample power to the mills above mentioned, and to cause an overflow of the banks of the stream in the low grounds. They claim that the amount of water thus drawn from the *bottom of the canal*, when supplementing the natural flow of the creek in rainy seasons, produces floods which are *unnatural and wholly unnecessary*, except when a break in the banks of the canal is threatened, in which event their remedy for any land damage is prescribed by law and no particular injury to health is liable to follow on account of the short time that such an inundation will last; and hence they demand that the State shall either deepen the creek in the town of Hartland sufficiently to enable them to drain their low lands and preserve their health, or else that it shall cause the waste of water from the bottom of the canal into the creek to be effectually and permanently stopped, except in cases of emergency for the safety of the canal.

Such are, in brief, the principal arguments of the local board of health and the residents interested in the district, in their effort to obtain relief at the hands of the State. Another reason alleged is that the State is virtually the *owner* of the channel of this creek from the Erie canal to its junction with the West Branch in the town of Newfane, and is therefore bound to maintain it in a proper sanitary condition. The only ground for this assertion appears to be a decision of the Board of Canal Appraisers, made when the Hon. Charles G. Myers was a member of said board, to the effect that the State had acquired the right to waste the waters of the canal into said creek, and claimed control of its channel. I regret that a copy of this decision was not at hand during my conference with the local board of health, and it can, therefore, be referred to only in the above indefinite manner. Regarding the legality of such a decision and its consequences so far

as the duty of the State in the premises is concerned, the undersigned can express no valid opinion, and must, therefore, defer to the advice of competent jurists.

The only criticism of the other arguments adduced by the authorities and residents of Hartland given above which I can at present offer is that a part of the trouble may have arisen from natural causes for which the State cannot well be held responsible, such as the gradual elevation of the bed of the creek in the low lands of Hartland by the deposit of silt which is washed down from the up-lands by every freshet, or the occurrence of accidental obstructions in the channel by trunks of fallen trees, or the growth of aquatic plants, etc.; but to what extent such natural causes have been instrumental in rendering swampy large areas on each side of the stream it will be difficult to determine. The presence of originally marshy patches of land or peat also complicates the problem from a strictly equitable point of view, so that a correct judgment as to the respective duties of the land-owners, on the one hand, and the State on the other, can only be formed after a thorough survey and examination of the locality has been made. If, however, the State is actually and legally the owner of the creek's channel, then the problem is at once solved, as in that event it will palpably become the duty of the State to grant the relief sought without financial assistance from the land-owners.

The examination of the creek and its margins in the town of Hartland and at the Erie canal on the date mentioned revealed the following facts:

1. The *natural flow* of the creek at the foot of the railroad culvert was comparatively insignificant.

2. No water from the canal was *flowing over the "spill-way" or "waste-weir,"* three days after the opening of navigation.

3. A considerable quantity of water, however, was escaping from the canal through one of the five *"waste-gates"* in the spill-way structure into the creek. The gate was partially open.

4. The first mill north of the canal was in operation at the time of my visit, the power being derived from one twenty-inch turbine wheel working under a head of twenty feet, and without materially lowering the level of the small mill-pond. The volume of water required for the operation of such a wheel is about eleven cubic feet per second, and as little water was found in the creek above or south of the canal, it is fair to infer that at least ten cubic feet per second of the needed supply was being furnished from the canal.

5. About two hours before my visit to this mill it had been operated to full capacity for a period of about one hour with *three* twenty-inch turbines as above, thus consuming about thirty-three cubic feet of water per second, or 2,000 cubic feet per minute; but the pond had then been nearly emptied. It is *not* claimed that the waste-gate in the spill-way had been opened further than what it was at the time of my inspection, in order to accommodate the demands of the mill.

6. From the canal to a point near the town line between Royalton and Hartland, the channel of the creek is deep and in a fair condition; but after entering its course through the lower terrace, its flow becomes sluggish with extensive meanderings.

7. From said town line to the bend, or abrupt change of direction of the creek, near the Ridge road, as indicated upon the accompanying

map, the margins of the stream are swampy for a considerable width on each side, and the creek was overflowing its banks. Some of the water found on the margins was doubtless due to the slight flood caused by the full operation of the mill two hours previous, and had not yet been evaporated. The length of this wet or swampy section of the creek's course is about two and one-fourth miles, in which the total fall is about six feet.

8. From the bend above mentioned westerly to near the highway known as the Orangeport road, a distance of about two and a half miles, the creek winds in an extremely tortuous course through a comparatively narrow strip of level meadow lands bordered by higher ground on each side. Occasional patches of swamp and wet land are found in this section, but nothing of sufficient consequence to cause wide-spread malaria. The surface of the water in the creek was generally about two feet below the level of the adjacent flat meadows, and the wet lands could readily be drained if considered necessary. No trace of the recent full operation of the mill could be discovered. The fall of the creek in this section is given upon the map at about eighteen and one-third feet.

9. From the Orangeport road to the highway called the "Checkered Tavern road," the stream flows through a wider expanse of flatlands, and extensive areas of marsh are now found on each side. Drainage is here impracticable without a lowering of the creek. The length of this section is about two miles, in which the fall of the creek is about six feet.

10. The remainder of the creek's course to its junction with the west branch in the town of Newfane is now similar to that described in section 8 above, the stream winding alternately from one high bank to the other, with intervening patches of alluvial meadow land between the loops. Several formidable drifts of logs and brush are found in this section, and in some places the high banks have been vigorously attacked by the current during the recent spring freshet, whereby large quantities of earth have been scoured away. No complaint regarding the *sanitary* condition of the creek and its margins was made. In a length of about two miles, the fall of the stream is seven feet.

It will thus be seen that there are two distinct sections of the creek's course which require attention from sanitary considerations, the first being the section from the town line between Royalton and Hartland to the Ridge road, described in section 7, above, and the second extending from the "Orangeport road" to the "Checkered Tavern road," described in section 9 above; but in the improvement of these two sections considerable work will first be required in deepening the remainder of the creek's channel so as to provide a suitable outfall.

In order to prepare a rational and economical design and specifications for the improvement of the district, it will be necessary to make a new and careful survey of the creek and its swampy margins, as the maps and records now on file in the canal engineer's office in this city are not sufficiently accurate for this purpose. The survey from which the original of the accompanying map was drawn was made seven years ago with the view of ascertaining approximately the extent of flooded areas in the valley, but not with reference to planning the details of a regulation of the channel. This map can, therefore, be considered only as a general outline chart showing the relative posi-

tions of the creek and its general course, but many of its sinuosities are not delineated, and hence it is impossible to trace thereupon correctly any required new work. Under the provisions of the act above mentioned, your board can request all necessary surveys and maps to be prepared by the State Engineer, and I, therefore, venture to suggest this course to you. When such accurate surveys have been made it will be a comparatively simple matter to plan the needed improvement and prepare specifications.

Regarding the responsibility of the State in the premises, I can offer little beyond what has already been mentioned. If the canal can *practically* be managed without continued recourse to the *waste-gate* in the spill-way, the State might perhaps content itself with the promulgation of positive orders to keep said gates tightly closed except in cases of extreme necessity for the safety of the canal banks. The correctness of the assertions of the local board of health and residents respecting the drying up of the marshy areas and their wholesomeness would then receive a practical test; and should the malaria continue, the burden of the cost of making the necessary improvements will fall upon the residents. But if, on the other hand, the State is found to be the owner of the creek's channel, or if the experience of the canal officials dictates that the *waste-gates* in the spill-way should be left more or less open, and that provision for the escape of a widely variable quantity of water at this waste-weir is essential to the successful operation of the canal, then it is obvious that the State should provide a suitable channel for this water, instead of permitting it to create a nuisance by saturating intermittently large areas of low lands.

The owners of the mill privileges on the creek north of the canal have also a certain share of the responsibility for the nuisance, since when operating their mills to full capacity with the water which has been allowed to accumulate in the ponds above their mill-dams, they discharge into the creek a much larger quantity of water per minute than its natural flow in dry seasons, and thus occasion a slight flood or overflowing of the banks in marshy places, which saturates the soil temporarily and thereby induces malaria. The precise measure of this responsibility cannot be determined without careful gaugings of the capacity of the stream's channel in the marshy sections; but any injury to the public health from this source can readily be prevented by proper action on the part of the local authorities.

Accordingly, as the case now stands, it would appear that the officials charged with the management of the canal should determine definitely the maximum amount of water which, *under ordinary circumstances,* is liable to be discharged through the waste-gates of the spill-way, and if such amount is greater than the stream can carry without overflowing its banks, then the channel should be sufficiently deepened at the State's expense. To provide for the removal of *unusually large* volumes of water from the canal through the creek's channel is unnecessary, as such a contingency is likely to occur only at rare intervals.

To render the entire district wholesome, the creek's surface, when carrying off the ordinary maximum discharge from the canal, together with its natural flow during the spring and summer months, should be at least two feet lower than the surface of the adjacent ground so that the latter could be properly drained and cultivated; but whether

the State should assume the entire cost of such improvement is a question which cannot be answered until an exhaustive survey and study of the locality has been made.

In conclusion it may also be mentioned that there is no evidence whatever of the existence of any contract or agreement on the part of the State to furnish a supply of water for power to the owners of the mill privileges; and that from a strictly professional point of view, it would seem that the waste of water from the canal at all such places should be reduced to a minimum in order to conserve and promote the interests of navigation.

The official reports of the Superintendent of Public Works contain many references to the fact that large volumes of water are taken surreptitiously from the canal for the purpose not only of furnishing power, but also of procuring a supply of water for farming operations in natural water-courses which have gradually become dry except in seasons of heavy rain-fall. The significance of these diversions of water from the State canals is in reality an attempt to convert the latter into duly recognized sources of supply for *irrigation* and *hydraulic power purposes;* but as the canals were built exclusively for navigation, it is obvious that the abstraction of water from said canals must at present be regarded as unlawful.

Respectfully submitted,

EMIL KUICHLING, *Civil Engineer.*

June 3, 1883.

The annexed certificates, affidavits and memorial are hereby officially filed and are recorded as supplementary to the similar and earlier papers of like import, which, on the 4th of May last, were made the basis of this Board's request to the State Engineer and Surveyor *in re* the Royalton and Hartland nuisance pertaining to the *east branch of the Eighteen-mile creek.*

ELISHA HARRIS, *Secretary.*

To the Secretary of the State Board of Health:

We the undersigned residents in the valley of the east branch of the Eighteen-mile creek, would respectfully represent: That in consequence of a large amount of water escaping at times from the waste weir of the canal the low lands along said creek for many miles are nearly or quite submerged, and also that said waters are at other times partially shut off; and the low lands are uncovered or nearly so, and that this varying condition of the stream is often repeated; and, also, that said low lands which in a natural state were dry and tillable have become in numerous places a continuous swamp, and under the changing conditions of moisture and dryness are a source of malaria affecting seriously the health of the inhabitants, and causing miasmatic disease in very many cases; and we would also represent that this condition of the stream and low lands and the consequent malarial results has existed in greater or less degree from the time of the enlargement of the canal until the present time, and we hereby request your honorable Board to relieve us of the nuisance herein com-

plained of, as provided in the Laws of 1883, chapter 291, entitled "An act to provide for the prevention of disease or sickness caused by the overflow or discharge of water from the canals of the State into creeks and water channels.

GEO. W. CHAPLIN,
JONATHAN C. DEUEL,
NASMYTH CLEGHORN,
MIAL W. PIERCE.

COUNTY OF NIAGARA, *ss.*:

Geo. W. Chaplin, Jonathan C. Deuel, Nasmyth Cleghorn and Mial W. Pierce, being duly sworn, say that the above complaint is true and correct.

Subscribed and sworn to before me, this 29th day of May, 1883.

[L. S.] SOLOMON RICHARDSON,
Justice of the Peace.

HARTLAND, N. Y., *May* 29, 1883.

I have been a resident and practicing physician in this section for seven years, on east branch of Eighteen-mile creek, and during that time I know personally that this complaint is true.

G. P. RICHARDSON, M. D.

HARTLAND, *May* 30, 1883.

This certifies that I have been a practicing physician in the vicinity of the east branch of Eighteen-mile creek, for eleven years and that the charges in the within complaint are known to me be true.

C. H. TURNER, M. D.

HARTLAND, *May* 30, 1883.

This is to certify that I have been a practicing physician in the region of the east branch of the Eighteen-mile creek for six years last fall and that the deleterious effect upon the public health caused by the condition of said creek as set forth in the within complaint are known to me to be true.

H. A. WILMOT, M. D.

JOHNSON'S CREEK, *May* 30, 1883.

This is to certify that I have been a practicing physician in the vicinity of the east branch of the Eighteen-mile creek in Royalton and Hartland for twenty-nine years and have seen much of the deleterious effects of this unsteady waste of water from the canal upon the public health. I also know the facts as set forth in the within petition to be true.

PETER FALING, M. D.

GASPORT, N. Y., *May* 31, 1883.

Having lived near east branch of Eighteen-mile creek for twenty-five years, can say that the complaint is true regarding the condition of said creek. Have been a practitioner of medicine for two years and know that a bad influence on public health has been the result of the swampy land created by unsteady waste of water from canal.

A. M. WHITON, M. D.

Gasport, N. Y., *May* 31, 1883.

This is to certify I have practiced in the vicinity of the east branch of the Eighteen-mile creek for about forty years, can say that the complaints above set forth in the effects of the waste water from the canal are true.

F. L. KNAPP, M. D.

Gasport, *May* 31, 1883.

REPORT

ON MALARIA AT CASTLETON, RENSSELAER COUNTY.

[By WM. S. EGERTON, C. E.]

ALBANY, *July* 26, 1883.

To the State Board of Health:

Through the courtesy of the officials of the postal card factory at Castleton, Rensselaer county, a careful inspection was made of the buildings, their surroundings, and the contiguous territory, extending from the reservoir, on the East, through the valley Westward to the New York Central and Hudson River railroad, embracing the larger portion of the area shown on the accompanying map, marked from "A" to "B," as "*Silted up, with little or no current.*" A still further inspection embraced the yards, outbuildings and slopes adjacent to the railroad tracks, in the northerly portion of the village of Castleton.

I could find nothing in the card factory buildings, or the process of manufacture, that would lead me to infer that there were malarial influences at work within them. There is nothing at the factory site, or in the immediate surroundings, that would lead me to suspect that the locality was malarious. A stream of rapid running water supplies power to the paper-mill. The banks of the stream are clean, abrupt, in places rocky; and the bed, as well as the marginal lines, gravelly. No stagnant pools, badly drained, or uncultivated areas surround the locality; and, after an inspection, which embraced a considerable portion of the outlying territory, I was led to look elsewhere for a source of the malarious effects complained of.

In the village of Castleton a primitive system of drainage and the disposal of waste and fecal matter exists. Vaults and outhouses are the rule, and the garbage is not always disposed of in a satisfactory manner. An examination of the slopes, in the rear of some of the dwellings along the line of the New York Central and Hudson River railroad, proved conclusively that some yards had been utilized for slops, garbage and ashes; and the outhouses were foul and

noisome. A depression, existing between the branch road to the card factory and the wagon road adjoining the tracts is utilized, to some extent, for a dumping ground of similar waste material.

A rigid inspection by the local board into the details of water supply, drainage, garbage and fecal waste would, no doubt, overcome many of the evils that are laid to other sources.

I am convinced, however, that one of the principal sources of malarious sickness in Castleton and the vicinity, exists largely in the silting up of the water areas, now exposed at the low stage of the tide, which have been, or were, previous to the jetty and wing dam system, constructed to improve the navigation of the Hudson river, free, or comparatively so, from malarious influences. The effect of this improvement to the channel, by concentrating the scour to the contracted limits embraced between the jetties, has been to deprive the inland channels of all scour, and to render them practically silting basins, without the vital and preservative influences of current from the parent stream (and as expressed in a communication by Samuel N. Payn to W. B. Taylor, State Engineer, dated March 16, 1863, recommending a system for improving the navigation of the Hudson river, between Albany and New Baltimore, nearly identical with that since adopted by the United States government), "rendering the jetties a lodgment place for the débris brought down the river and that excavated from its bed, while at the same time securing all the deposits brought by the lateral streams." This has been the practical effect of the system of jetties as constructed, and shown upon the accompanying map or tracing, between the points "A and B" on the East shore, and "C and D" on the West shore of the river. The mouth of the inlet at "A" and the outlet at "B," being closed, there can be no tidal scour, and but slight circulation, except that furnished by the lateral stream from inland, which brings down silt, but to add its quota to the accumulations from the Hudson river.

A remedy cannot, at this stage of the silting process, be secured without endangering the navigation of the Hudson, by permitting a vent and direct scour from "A to B," or *vice versa*, as the tides would determine; such remedial measures being applicable to localities all along the jetty system, as shown on the west shore from "C to D" on the accompanying tracing, would seem to preclude local treatment of this character.

Respectfully submitted,

WM. S. EGERTON, *C. E.*

SCALE 2000 FT.=1 INCH.

SKETCH
OF TERRITORY ADJACENT TO
CASTLETON
ACCOMPANYING
REPORT DATED JULY, 26TH 1883.

Wm S. EGERTON C.E.

REPORT OF DR. BROOKS.

ALBANY, *August* 4, 1883.

To the State Board of Health of New York:

I have visited the village of Castleton and environs, in company with W. S. Egerton, the Engineer of the Board.

In order to facilitate matters I shall refer to a rough outline of the village and surroundings which I have hastily prepared for that purpose. The outline represents the village of Castleton and all points adjacent, which act as factors in the production of the present trouble.

The portion marked "A" on the diagram, represents an almost stagnant pond which is due to the obstruction of the natural flow of water by the government dike "B B," only two small openings at "H" being present, a condition which augments to a considerable degree the flow of water at that spot.

Between the islands and the railroad embankment there is a scum of decomposing vegetable matter, of variable thickness, over almost the entire surface of water at that point, and at the portion of the inclosure marked "A", the bottom of the river is frequently exposed to the rays of the sun at low tide for several hours during the day, and considerable annoyance is produced thereby. Mr. Campbell, who resides directly east of this locality, at a distance of a few rods, made the following statement: "At night, and especially when the tide is low, an intolerable odor emanates from the surface of water between the islands and mainland which causes all adjacent residents to take refuge in their abodes."

At the point marked "F", a creek enters the partially stagnant pond which averages about ten feet in width, and has a current with a velocity of about five miles per hour. The increase or diminution of its flow to a certain degree can be regulated by the paper mills situated about half a mile from the river. This stream acts as an important factor in producing the current which is just perceptible at the spots, or inclosure marked "A" "A"

Another source of danger to the public health is found between the backs of the houses and railroad tracks marked "C" "C". Here we find on the surface of the ground the daily refuse of the kitchen. While examining this locality every evidence that the decomposition of the deposited matter, both animal and vegetable, was at its height was appreciable. At the time of investigation a mid-day sun was shining directly upon the mass. All of these

residences use unsewered vaults for the daily deposition of refuse matter of the household and the excrement of the families; and as they have never been known to have been cleansed, they were closely examined and a large percentage of the odor of that region was directly *traced* to *them*.

At the spot marked "D", an open, broken down drain is noticeable which runs for fifteen or twenty feet uncovered (width about two and a half or three feet). During the inspection of this locality, a disinterested citizen made a statement to the effect, that the "authorities were about to rebuild and enlarge it in the course of a few days."

"E" on the diagram represents a house at the junction of the street and railroad. Directly under a window on the ground floor of this residence, a large mass of kitchen refuse was noticed which emitted a very unpleasant odor. This spot had served, as was subsequently ascertained, as a "dumping ground" for the refuse of that house for a long time. In this house several cases of fever with malarial symptoms had occurred, and some were sick in it at the time of inspection.

Conclusions. — In relation to the semi-stagnant pond existing at "A" "A" "A", I would simply state that an increased current is needed to remove the silt and scum which is daily being deposited.

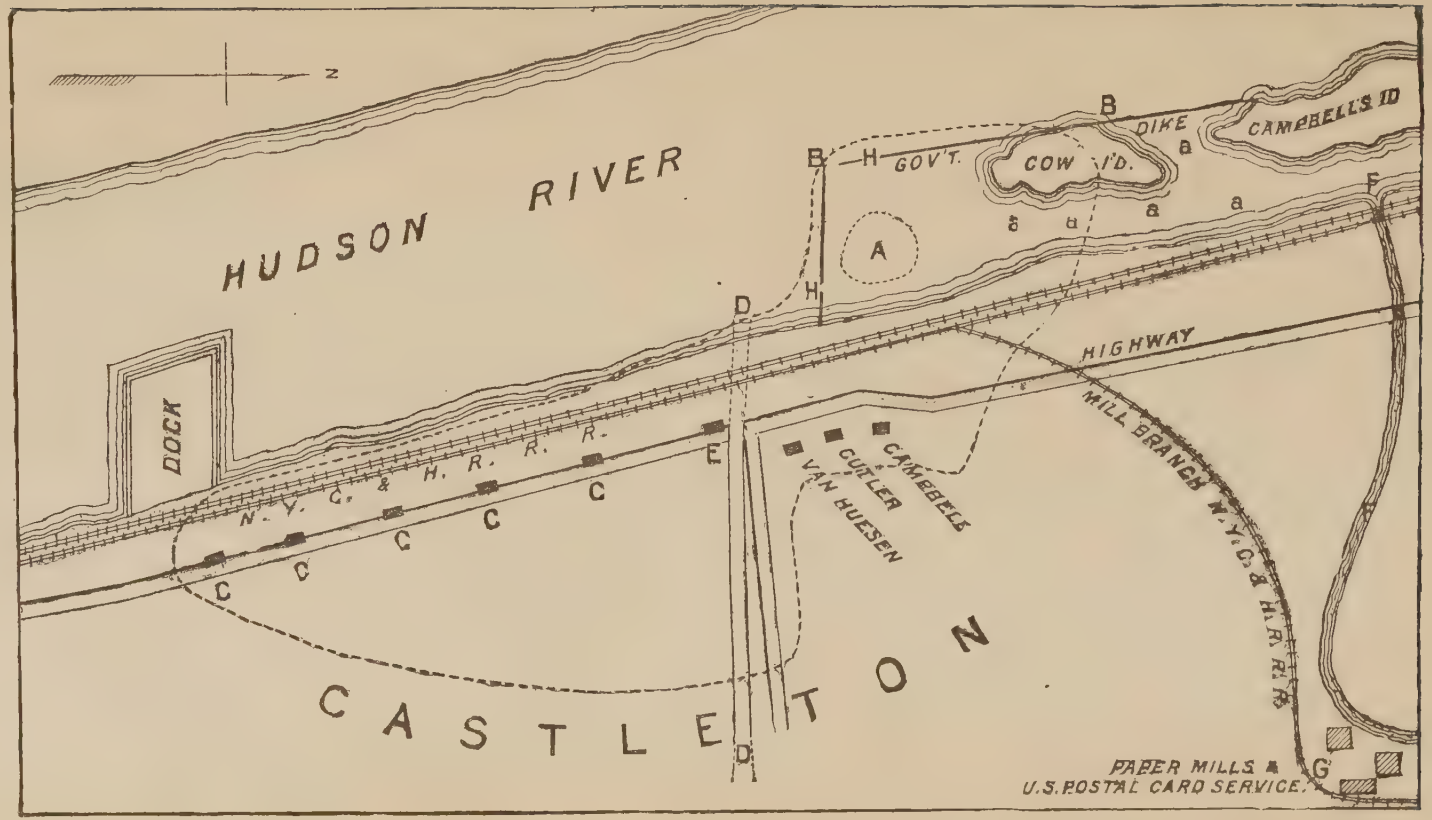
Inasmuch as the locality of the endemic can be located within the red dotted line (see diagram), it can be stated with certainty that the trouble is entirely local, and has no origin whatever in the region of the paper-mill, "G", as originally supposed. Many of the operatives suffering from the fever considered the mill and its surroundings as the ætiological centre, but on closely examining the mill officials and the employees, it was found that many, if not all, who were at that time sick, lived in the village of Castleton within the dotted lines.

The mill "G" is situated upon a higher grade, by several feet, than the highway by the river, or as it is familiarly known, as the "River road," and the natural drainage from the mill is as perfect as could be desired. The rags from which the paper pulp is made go through a thorough system of disinfection.

Decided action directed toward the local deposition of garbage and refuse from kitchens at "C" and "E", which can be remedied, would reduce to a considerable degree the amount of sickness at present prevailing in, and near Castleton.

Respectfully submitted,

GEORGE FREDK. BROOKS, *Inspector.*


N
HUDSON RIVER
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DIKE
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N. Y. C. & H. R. R. R.
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CUTLER
VAN HUESEN
CAMPBELLS
MILL BRANCH N.Y.C. & H.R.R.R.R.
CASTLETON
D
PAPER MILLS &
U.S. POSTAL CARD SERVICE.
G

REPORT

ON GLUCOSE FACTORIES AT BUFFALO, BY A. L. COLBY.

To Prof. CHARLES F. CHANDLER,

Chairman of the Sanitary Committee :

I have the honor to submit the following report on the glucoseries of Buffalo, N. Y.

In answer to instructions received from you I visited the factories at Buffalo, on September 14 and 15, 1882, and from samples collected and notes taken during inspection, I report as follows:

There are three glucose factories at Buffalo.

American Grape Sugar Co., Cicero J. Hamilin, president ; office 19 and 21 West Swan street ; factory on Scott street and Hamburg canal.

Buffalo Grape Sugar Co., Cicero J. Hamilin, president ; office 19 and 21 West Swan street ; factory on Court street near Erie canal.

The Firmenich Sugar Refining Co., Joseph F. Firmenich, president ; office 22 West Seneca street ; factory on Jefferson street near William.

The following table gives an approximate idea of the extent of this industry :

Statistics of Manufacture of Glucose and Grape Sugar, Buffalo, N. Y.

FACTORY.	Average amount corn used daily.		Amount starch produced daily.		Amount cattle feed produced daily.		Amount solid matter discarded daily.		Number gallons water used daily.*
	Bushels	Pounds	Bushels	Pounds	Bushels	Pounds	Bushels	Pounds	
American..... ...	8,000	448,000	4,286	240,000	2,000	112,000	1,714	96,000	3,000,000
Buffalo	4,500	252,000	2,411	135,000	1,125	63,000	964	54,000	2,000,000
Firmenich.....	5,000	280,000	2,679	150,000	1,250	70,000	1,071	60,000	2,500,000
Total..... .	17,500	980,000	9,376	525,000	4,375	245,000	3,749	210,000	7,500,000

In this table the amount of corn used daily is estimated from a general yearly average ; even this is only approximate, as the consumption varies greatly with the market. The calculation is made on the following basis :

One bushel of corn equals 56 pounds.

On treatment this yields :

Starch, equal to 30 pounds ; cattle feed, equal to 14 pounds ; waste, equal to 12 pounds ; total, 56 pounds.

*About two-thirds of this amount is used only for condensing.

REMOVAL OF WASTE MATERIAL.

This large amount of solid matter is carried from these factories, either suspended or dissolved, in the *wash waters* which run in the Erie canal.

By fermentation this gluten and other nitrogenous matter gives rise to the offensive odors complained of at Tonawanda, Lockport, and the intermediate places along the Erie canal.

SAMPLES.

In the accompanying outline of the process of manufacture, it is shown by the dotted lines whenever *wash waters* are discarded from the works.

Samples of each of these waters were obtained from all three factories.

Appended is a detailed description of the various steps in the process.

A tabular statement showing the results of the analysis of the waste-waters has been furnished by Prof. Lattimore.

PROCESS.

1. *Steeping.** The corn already shelled and screened (variety used known as "No. 2, Chicago Mixed") is weighed out into hoppers and run into wooden vats (holding 500 to 1,000 bushels), in which there is enough warm water to cover the corn. Temperature of water, after corn is introduced is maintained at 130 degrees to 140 degrees Fahr. Here it is soaked from thirty-six to forty-eight hours. The water is renewed after twenty-four hours, the object being to soften the corn and keep it sweet.

This water is discharged into the canal. Samples of this water from the steeping tanks are marked † A 1, B 1, F 1.

2. *Milling.* The softened corn is next passed through burr stone mills and ground with a constant current of water.

3. *Separation of starch.* This paste from the mills is passed over the "shakers," or "starch separators," which are frames covered with bolting cloth (No. 9), kept in constant motion and sprayed with water.

Feed. The residue thus separated is collected, dried and sold as *cattle feed.*

Starch. The starch passes through the bolting cloth in suspension in water. It is run into wooden vats and is allowed to settle. The water drawn off is discarded.

Samples of this water from starch settlers are marked A 2, B 2.‡

4. *Treatment of Starch:*

(a.) *Treatment with alkali.* The starch is next agitated in vats for two or three hours with weak alkali and pumped up into the *runs* or *starch tables.*

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* There are four methods of steeping: 1. Water alone. 2. Dilute sulphuric acid. 3. Dilute alkali. 4. Sulphurous acid. The first method is used entirely at Buffalo.

† The letters designate "American," "Buffalo," and "Firmenich."

‡ There is no F 2, as in Firmenich's factory they do not settle the starch here, but mix directly with alkali and run on to tables.

(b.) *Separating in runs.* Here the starch deposits, the alkaline water running off from these *runs*, containing much glutenous matter, is discarded.

Samples of this alkaline water from starch tables are numbered A 3, B 3, F 3.

According to the statement of the chemist of the American Grape Sugar Co., this solid matter in suspension in the water which runs off from the starch table, when dried and analyzed, shows *four per cent of nitrogen*, which equals twenty-six per cent of nitrogenous matter. This, he states, amounts to two to three per cent of nitrogenous matter on the amount of corn used.

5. *Mixing the starch.* At the American Grape Sugar Co.'s works the starch is collected from the runs and washed with water by agitation in large vats, then allowed to settle and the water discarded.

Sample of this wash-water is numbered A 4.

At the Buffalo and Firmenich Works this extra washing is dispensed with, so there are no numbers B 4 and F 4.

The washed starch is then thoroughly mixed into a cream by long agitation with water.

6. *Conversion:*

1. *Open converters.* These are wooden vats holding 3,000 to 4,000 gallons (or the starch from 1,000 bushels of corn), and containing a bank of copper steam coils. A little water is first run into the vat and then the *sulphuric acid* (one to one and one-half per cent) is slowly added. This dilute acid is brought to a boil and the starch cream slowly added, keeping the liquid constantly boiling. After all the starch is added a slow ebullition is kept up for two hours in making glucose, and three hours in making grape sugar.

2. *Closed converters.* These are copper vessels holding the products of 300 bushels of corn. The starch and acid are boiled under pressure. The conversion of one charge occupies only nine minutes.

7. *Neutralization.* The acid glucose solution is next treated with marble dust (carbonate of lime or whiting is sometimes used), and the resulting sulphate of lime allowed to settle out.

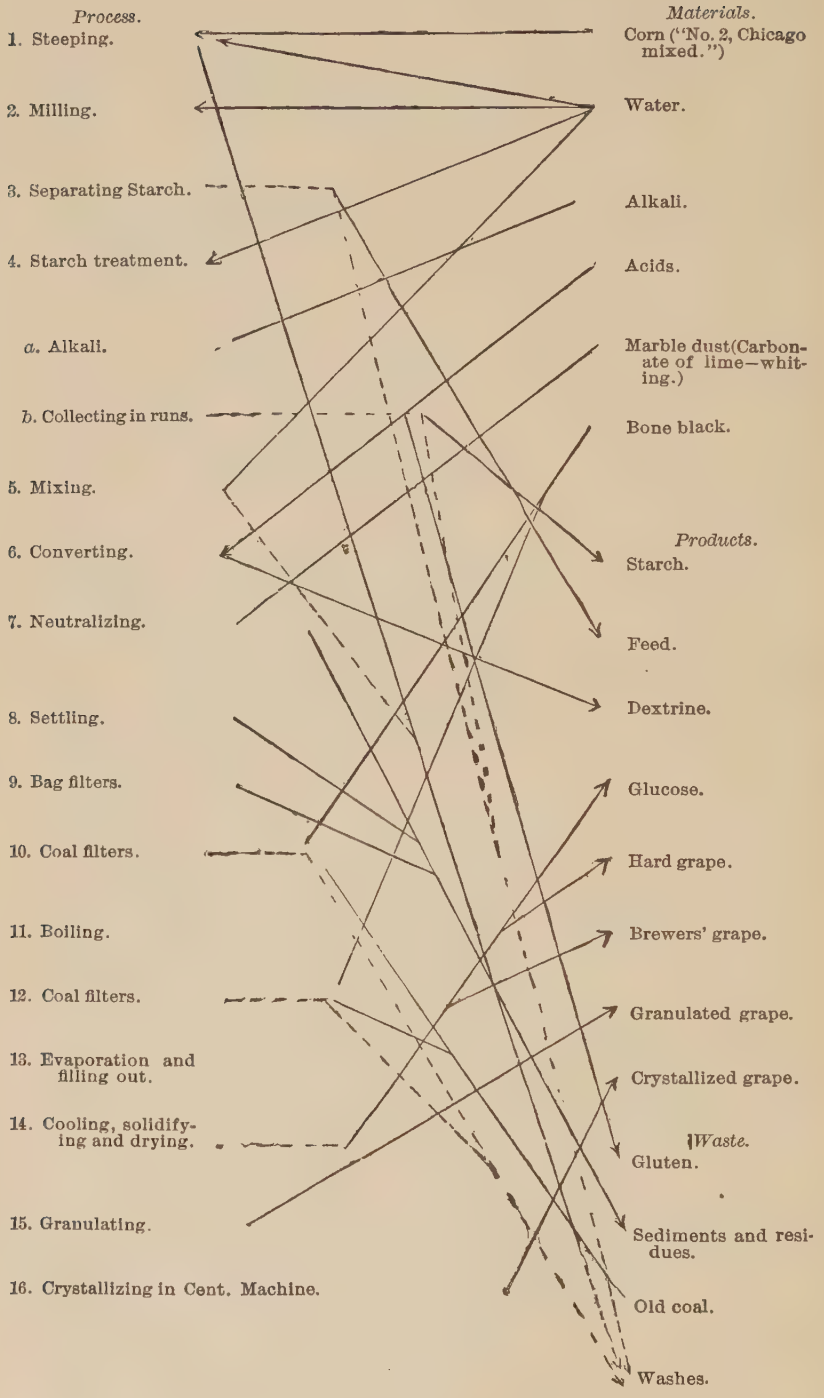
8. *Filtration and concentration.* The neutral solution is then filtered through filter presses or bag filters, bleached with sulphurous acid, and filtered over bone black, then concentrated in vacuum pans at a temperature of 140 degrees F., to 30 degrees B., refiltered over charcoal and the black washed till liquid stands at 27.5 degrees B., when the syrup is again boiled down in a vacuum pan to 40 degrees to 42 degrees B., refiltered and packed for shipment.

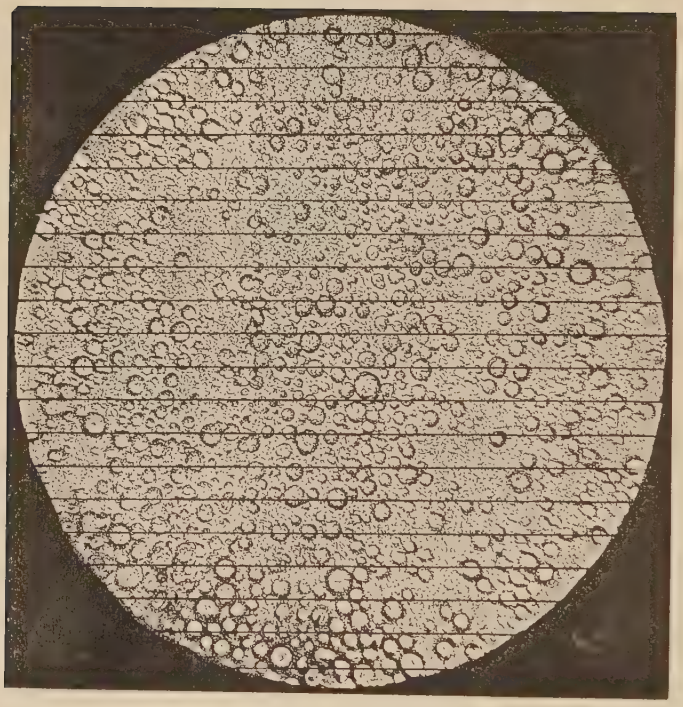
Removal of Sugar from Bone Black.

After the filtration of any syrups through the bone black filters, the glucose left in the black is washed out with water. These washings being saved for concentration until they have a gravity of 1 degree B. The water then remaining in the black is run away as waste.

Samples of the water from the bone black filters are marked A 5, B 5, F 5.

Respectfully submitted,
ALBERT L. COLBY.


Process.
1. Steeping.
2. Milling.
3. Separating Starch.
4. Starch treatment.
a. Alkali.
b. Collecting in runs.
5. Mixing.
6. Converting.
7. Neutralizing.
8. Settling.
9. Bag filters.
10. Coal filters.
11. Boiling.
12. Coal filters.
13. Evaporation and filling out.
14. Cooling, solidifying and drying.
15. Granulating.
16. Crystallizing in Cent. Machine.
Materials.
Corn ("No. 2, Chicago mixed.")
Water.
Alkali.
Acids.
Marble dust(Carbonate of lime—whiting.)
Bone black.
Products.
Starch.
Feed.
Dextrine.
Glucose.
Hard grape.
Brewers' grape.
Granulated grape.
Crystallized grape.
Waste.
Gluten.
Sediments and residues.
Old coal.
Washes.



FAT GLOBULES.

REPORT

ON MILK AND ITS ADULTERATIONS, BY EDWARD W. MARTIN.

NEW YORK, *January* 28, 1884.

ELISHA HARRIS, M. D., *Commissioner and Secretary:*

SIR — According to your instructions I have the honor to make the following report on milk and its adulterations:

Cows' milk is a white fluid, of a bland sweetish taste, of a faintly alkaline reaction when fresh, and consists of an emulsion of fats in a solution of caseine together with certain inorganic salts, viz.: Chlorides and phosphates of potash, soda, lime and magnesia. Under the microscope it becomes evident that the white color of milk is due to the fat globules, which are small globular bodies of a yellow color and a pearly gloss. By some it is believed that each of these globules is surrounded by an envelope of albumen. Figure 1 is a photograph from the microscope showing the fat globules. The spaces between the vertical lines are $\frac{1}{2500}$ of an inch.

Fig. 1.

When milk is allowed to stand for some time, these globules rise to the surface and form cream below, which remains a bluish fluid, containing the greater part of sugar of milk, salts and caseine, the latter in the form of caseine-soda. When milk is kept for some time a portion of the sugar is decomposed and is converted into lactic acid, by aid of the caseine which acts as a ferment. The lactic acid, in its turn, decomposes the caseine-soda, the caseine separates and the ordinary sour milk is formed. By long keeping, all of the sugar of milk is decomposed into lactic acid and a small quantity of alcohol.

The constituents of milk are water, salts — inorganic foods; olein, stearin, palmatin, butyrin, caproin, caprylin, rutin — fats, hydrocarbon foods; sugar — carbohydrate foods; caseine and albumen — protein foods.

We see from the above table that milk contains all of the organic and inorganic elements required for food, and it is the only article of nourishment supplied by nature, containing all of the constituents of a true mixed food, and in a form to be easily digested.

The water found in milk is the same as ordinary water. The salts found consists of, according to Blyth, K_2 O, 18.82 per cent; Na_2 O, 11.58 per cent; Ca O, 22.97 per cent; Fe_2 O_3, 0.06 per cent; P_2 O_5, 27.03 per cent; Cl, 16.23 per cent; Mg O, 3·31 per cent. The fats found consist of olein, 42.21; stearin and palmatin, 50.00; butyrin, 7.69; caproin, caprylin, rutin, .10.

The caseine, which is the chief nitrogenized constituent, is not precipitated by heat but is coagulated by alcohol, and all of the acids except carbonic, which redissolves it in excess. It contains 15.8 per cent of nitrogen and about one per cent of sulphur. Coagulated caseine is soluble in caustic alkalies. According to Hassell, moist caseine undergoing putrefaction yields sulphide and carbonate of ammonia, together with valeric and butyric acids and an oily body having a disagreeable odor.

According to Bopp, a crystalline body possessing a powerful odor is also formed.

Besides caseine, milk contains albumen and lacto-protein. If the caseine is first removed, by adding a small quantity of acetic acid and the resulting solution boiled, the albumen will be precipitated, and may be separated by filtration. One and a half per cent of albumen has been found by the above method. Milk sugar or lactose has the formula, C_{12} H_{22} O_{11}. It is fermentable.

It crystallizes in hemihedral trimetric crystals. It is less sweet than either cane sugar or glucose, and is soluble in five to six parts of cold and two and a half parts of boiling water. The water solution is dextro-rotatory, according to Biot, 60.28 degrees.

It is soluble in acetic acid, but is insoluble in alcohol and ether.

Potash soda, ammonia and oxide of lead form with it compounds. Heated to a temperature of 160° C. it turns brown; at 175° C. it is converted into lacto-caramel with loss of water. Strong mineral acids decompose it. It is also decomposed by oxidizing agents. It reduces silver from its solutions, and precipitates copper from an alkaline solution of that metal. Distilled with sulphuric acid it yields formic acid, and with nitric acid, mucic, saccharic, tartaric, racemic and oxalic acids.

Milk sugar is less readily fermented than cane or grape sugar, not passing into alcoholic fermentation until some time after being brought into contact with yeast.

PROPORTIONS OF THE CONSTITUENTS OF AVERAGE MILK.

These vary and more especially the fatty matter, according to the age, breed, time after calving, food, condition of the animal, etc. But even taking into consideration all of these factors, nature in its efforts to produce a food fit for the young will overcome, to a remarkable degree, surroundings which are most antagonistic to the production of milk of a good quality. It seems to be a fact that the richness of the milk is proportional to the quantity given. That is, the greater quantity of milk the less the amount of total solids, and of these the fat in a smaller quantity.

This is seen on reference to the following table, where the milk from Jersey and Holstein cows are compared. It being well known that the Jersey or Alderney gives less milk, but richer in fat and solids not fat, while on the other hand the Holstein give more milk but less fat and solids not fat:

	Average of 10 cows.	
	Jerseys.	Holstein.
Water	82.45	87.14
Fat	6.79	3.32
Sugar	4.19	4.23
Caseine	5.73	4.49
Salts	.79	.78

Average amount given per day — Jerseys, 10 quarts; Holsteins, 19 quarts.

So much has been written on the standard for pure milk that it is now known with absolute certainty that the variation in average cow's milk is between certain well-defined limits. The following authorities giving them as follows :

	Henry and Chevalier.	Poggiale.	Hassell.	Wanklyn.	Carter Bell.
Water	87.03	86.28	86.83	87.55	86.20
Fat	3.13	4.38	3.93	3.07	3.70
Sugar	4.77	5.27	4.53	4.62	9.14
Caseine	4.48	3.80	4.14	4.04	
Salts	.60	.27	.67	.72	.76
Total solids	12.98	13.72	13.17	12.45	13.80
Solids, not fat	9.85	9.34	9.34	9.38	9.90

Having made from time to time analysis of milk from cows of all breeds, and kept under all conditions of various ages and at different times of the year, I found the percentage of the maximum, minimum and average constituents to be :

	Maximum.	Minimum.	Average.
Water	82.04	87.87	87.5
Fat	7.59	2.78	3.3
Sugar	5.39	4.60	4.4
Caseine	4.34	4.30	4.1
Salts	.71	.65	.7
Total solids	17.96	12.13	12.5
Solids, not fat	10.37	9.35	9.2

Of the minimum amount of fat given above, only three cows were found giving milk so poor in fat, and their food and surroundings were of the poorest kind.

During the year 1883 I made many analyses of milk taken from the cans while being shipped to market, and the average percentage of the constituents of the samples taken were :

Water	87.5
Fat	3.2
Sugar	4.4
Caseine	4.1
Salts	.7
Total solids	12.5
Solids not fat	9.3

From the foregoing results it is fair to assume that in average milk we should have at least three per cent of fat, nine and two-tenths per cent of solids not fat, and twelve and two-tenths per cent of total solids.

The State Board of Health of New Jersey have fixed the minimum amount of total solids at twelve per cent and the maximum amount of water at eighty-eight per cent.

In Massachusetts, the law fixes a chemical standard of purity ; it reads : "In all cases of prosecution if the milk shall be shown upon analysis to contain more than eighty-seven per cent of water or to contain less than thirteen per cent of milk solids, it shall be deemed for the purpose of this act to be adulterated."

This standard has been fixed from analyses by Sharples, Babcock and others, as follows:

Analysts.	No. of cows.	Total solids.
Sharples	22	14.49
Babcock	8	14.55
Vaughn	58	14.08
Newton	24	14.26

Average specific gravity of milk.

This subject is one of the greatest importance in connection with the inspection of milk, for the lowest possible specific gravity of milk having been determined, the adulteration of milk by the addition of water is readily detected. That milk has a specific gravity varying between certain well-defined limits there can be no doubt. The question then is what are these limits ?

During the winter of 1880, by direction of the New York City Health Department, in company with Charles E. Munsell, Ph. B., I visited various dairy farms in Westchester county, and the following tables show the result :

Farm of Edward B. Brady, Golden's Bridge; herd of sixty-six cows; evening's milk, January 20, 1880; food, brewers' grains, barley sprouts, corn meal and cotton meal:

Number of cow	Breed.	Age of cow.	Number of times calved.	Time of calving.	Number of qts. given.	Specific gravity at 60° F.
1	C.....	5 years	3	Nov. 1879	5	1.03132
2	C.....	5 years	3	Dec. 1879	5	1.03103
3	C.....	7 years	4	Aug. 1879	5	1.03306
4	C.....	3 years	1	Oct. 1879	2	1.02987
5	C.....	9 years	5	July, 1879	4	1.03219
6	C.....	6 years	3	July, 1879	5	1.03161
7	C.....	4 years	2	July, 1879	6	1.03364
8	C.....	6 years	3	July, 1879	5	1.03248
9	C.....	6 years	2	Aug. 1879	6	1.03248
10	C.....	5 years	2	Oct. 1879	6	1.03190
11	C.....	10 years	6	May, 1879	6	1.03219
12	C.....	4 years	2	June, 1879	5	1.03161
13	C.....	5 years	3	July, 1879	6	1.03074
14	C.....	9 years	5	June, 1879	7	1.03364
15	C.....	5 years	2	Jan. 1879	8	1.03074
16	C.....	8 years	3	May, 1879	6	1.03364
17	C.....	5 years	2	July, 1879	7	1.03132
18	C.....	5 years	3	Sept. 1879	6	1.03306
19	C.....	5 years	2	May, 1879	6	1.03364
20	C.....	6 years	3	May, 1879	4	1.03219
21	C.....	8 years	5	Nov. 1879	8	1.03480
22	C.....	6 years	3	May, 1879	8	1.03364
23	C.....	6 years	4	Oct. 1879	6	1.03190
24	C.....	9 years	4	July, 1879	3	1.03132
25	C.....	4 years	2	Sept. 1879	4	1.03132
26	C.....	4 years	3	Aug. 1879	4	1.03074
27	C.....	6 years	3	Nov. 1879	4	1.03132
28	C.....	4 years	2	Mch. 1879	5	1.03132
29	C.....	6 years	3	April, 1879	7	1.03132
30	C.....	4 years	2	Mch. 1879	4	1.03074
31	C.....	7 years	3	Feb. 1879	5	1.03045
32	C.....	11 years	4	July, 1879	9	1.02987
33	C.....	8 years	3	Mch. 1879	7	1.03045
34	C.....	9 years	4	April, 1879	6	1.03074
35	C.....	7 years	3	Oct. 1879	4	1.03016
36	C.....	7 years	3	April, 1879	8	1.03132
37	C.....	7 years	3	July, 1879	4	1.03190
38	C.....	4 years	2	June, 1879	9	1.03219
39	C.....	5 years	3	Sept. 1879	6	1.03074
40	C.....	11 years	6	Oct. 1879	5	1.03103

Farm of Edward B. Brady — (Continued).

Number of cow.	Breed.	Age of cow.	Number of times calved.	Time of calving.	Number of qts. given.	Specific gravity at 60° F.
41	C.....	7 years	3	Feb. 1879	5	1.03074
42	C.....	3 years	1	Jan. 1879	4	1.03132
43	C.....	6 years	3	Sept. 1879	6	1.03016
44	C.....	5 years	2	Feb. 1879	3	1.02987
45	C.....	2 years	1	Aug. 1879	5	1.03103
46	C.....	5 years	2	June, 1879	6	1.03248
47	C.....	5 years	3	Sept. 1879	5	1.03132
48	C.....	9 years ...	6	Oct. 1879	9	1.03161
49	C.....	6 years	3	Sept. 1879	4	1.03132
50	C.....	6 years	2	Sept. 1879	4	1.03161
	Average.....					1.03161

Farm of Peter Knox, Bedford Station; morning's milk, herd of about thirty-five cows; food, corn meal and corn stalks; January 20, 1880.

Number of cow.	Breed.	Age of cow.	Number of times calved.	Time of calving.	Number of qts. given.	Specific gravity at 60° F.
1	C.....	7 years	3	Nov. 1879	8	1.03161
2	H.....	3 years	2	Aug. 1879	8	1.03248
3	C.....	6 years	3	Nov. 1879	10	1.03103
4	C.....	8 years	4	Jan. 1878	8	1.03161
5	C.....	6 years	4	Aug. 1879	10	1.03190
6	C.....	6 years	3	July, 1879	3	1.03045
7	C.....	6 years	4	May, 1879	3	1.03103
8	C.....	4 years	1	Aug. 1879	4	1.03016
9	C.....	6 years	4	Nov. 1879	4	1.03190
10	C.....	7 years	4	July, 1879	4	1.03190
11	½ A.....	4 years	2	Oct. 1879	3	1.03219
12	C.....	4 years	2	Jan. 1879	8	1.03161
13	C.....	4 years	2	May, 1879	8	1.03103
14	C.....	4 years	2	Apr. 1879	6	1.03045
15	C.....	4 years	1	Sept. 1879	7	1.03045

Farm of Peter Knox — (Continued).

Number of cow.	Breed.	Age of cow.	Number of times calved.	Time of calving.	Number of qts. given.	Specific gravity at 60° F.
16	C	4 years	1	Nov. 1879	8	1.03103
17	C	8 years	4	Oct. 1879	6	1.03504
18	C	6 years	3	Oct. 1879	6	1.03074
19	C	4 years	1	Oct. 1879	8	1.03132
20	C	9 years	5	Sept. 1879	10	1.03103
21	C	3 years	1	Oct. 1879	3	1.03016
22	C	5 years	3	Aug. 1879	4	1.03132
23	C	6 years	3	Sept. 1879	6	1.03219
24	C	4 years	2	Nov. 1879	5	1.03248
25	C	3 years	1	Nov. 1879	8	1.03422
26	C	3 years	1	Nov. 1879	3	1.03364
27	C	3 years	1	Nov. 1879	4	1.03190
28	C	6 years	3	Sept. 1879	8	1.03219
29	C	3 years	1	Sept. 1879	7	1.03161
30	C	3 years	1	Nov. 1879	4	1.03306
31	C	4 years	2	Nov. 1879	4	1.03016
	Average					1.03149

Farm of George Nelson, Katonah; herd of about sixty cows: evening's milk, January 21, 1879; *food, brewers' grain and corn meal.*

Number of cow	Breed.	Age of cow.	Number of times calved.	Time of calving.	Number of qts. given.	Specific gravity at 60° F.
1	D	6 years	4	Apr. 1879	5	1.03364
2	D	7 years	4	Mar. 1879	5	1.03074
3	D	6 years	3	Apr. 1879	6	1.03248
4	D	6 years	4	Apr. 1879	6	1.03277
5	C	5 years	3	Mar. 1879	7	1.03190
6	C	6 years	3	May, 1879	8	1.03219
7	C	5 years	2	Apr. 1879	6	1.03161
8	C	7 years	4	Apr. 1879	10	1.03190
9	C	5 years	2	Mar. 1879	7	1.03161
10	C	4 years	1	Aug. 1879	6	1.03074

Farm of George Nelson — (Continued .

Number of cow.	Breed.	Age of cow.	Number of times calved.	Time of calving.	Number of qts. given.	Specific gravity at 60° F.
11	D.....	4 years	2	July, 1879	10	1.03074
12	C.....	6 years	3	June, 1879	8	1.03016
13	C.....	5 years	2	June, 1879	6	1.03074
14	C.....	5 years	2	Sept. 1879	5	1.03132
15	C.....	7 years	4	Apr. 1879	7	1.03190
16	D.....	4 years	2	Aug. 1879	9	1.03393
	Average					1.03175

Breed — D., Durham; C., Common or Native.

Specimen of the milk of cow No. 2 was taken for analysis, the result of which was as follows:

Water	86.39
Butter	4.44
Sugar	3.78
Caseine and albumen	4.36
Salts	.69

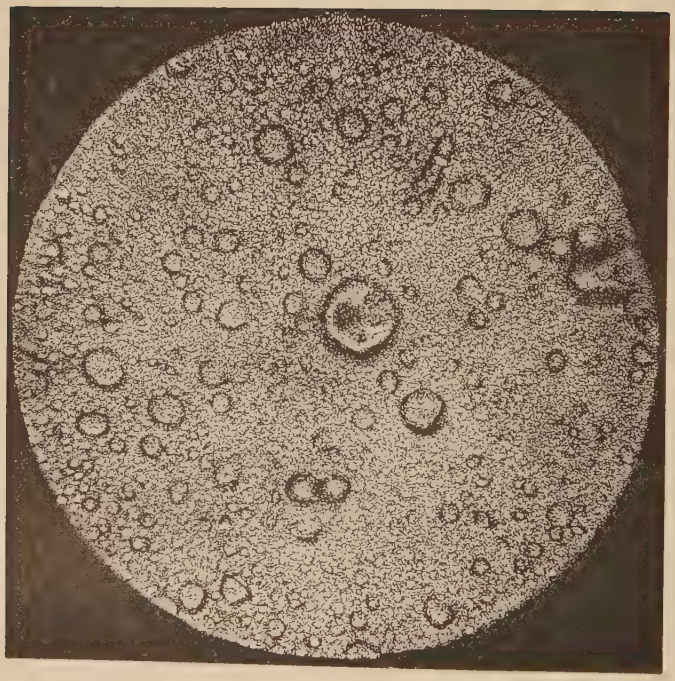
And the average specific gravity was 1.03169 at 60° F.

Dr. John B. Isham found the following results from the examination of milk from six dairies, 113 cows in all:

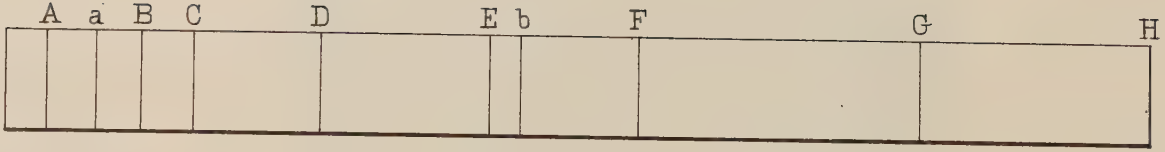
Dairy.	No. of cows.	Average sp. gr. at 62° F.
1	46	1.03045
2	34	1.03190
3	10	1.03770
4	8	1.03480
5	10	1.03306
6	5	1.03074
Average		1.03182

Dr. J. Blake White found the following results from the examination of milk from six dairies:

Dairy.	No. of cows.	Average sp. gr. at 60° F.
1	22	1.03132
2	13	1.03161
3	16	1.03219
4	15	1.03132
5	15	1.03074
6	48	1.03103



UNHEALTHY MILK.



BLOOD IN MILK.

Doctors Waller, O'Connor and Rowland, from an inspection of the milk of 222 cows, found the average specific gravity, at 60 degrees F., to be 1.03323. These tests given were made at different times of the year and on milk from cows of all breeds. Only two cases were found where the specific gravity of the milk fell below 1.029 at 60 degrees F. The average of all these tests being 1.03212 at 60 degrees F.

Dr. Wm. K. Newton, State Inspector of Milk for New Jersey, found the average specific gravity of pure milk to be 1.030, and in no case did he find it below 1.029, milk from 200 cows tested.

During 1883, Charles E. Munsell, Ph. B, and myself found the average of specific gravity of the milk pronounced by us to be pure to be 1.03161. This result was obtained from the examination of not less than 5,000 specimens of milk in its transit to the New York markets. The average specific gravity of pure milk inspected by the New York City Board of Health Inspectors, in New York city, during 1880, '81, '82 and '83, some 20,000 samples having been tested, was 1.03132 at 60 degrees F. If, then, the average specific gravity of pure milk is placed at 1.029, it is certainly at its lowest possible point.

Unhealthy and Abnormal Milk.

It is only at one period that a healthy cow will produce unhealthy milk, and that is shortly after the birth of the calf, at which time the milk is full of colostrum cells. These are placed in the milk by nature for the purpose of purging the calf. Should this milk, or a mixture of it with other milk, be taken by young children or by persons with weak stomachs it might prove unhealthy.

The photograph given below is made from the microscope and shows the appearance of the colostrum cells magnified 420 diameters.

The cream rising on such milk is usually of a reddish color. It should be skimmed off, diluted with water and examined with the microscope.

Occasionally blood is found in milk and may be detected by the spectroscope. The absorption bands of the Haemaglobin are given in the following diagram:

Also by the microscope, although it is hard to distinguish between the fat and blood globules. A method recommended by some authorities is to add to the milk an alcoholic solution of guyac. A blue color is produced if blood be present. Blyth mentions, in his Manual of Practical Chemistry, pages 56 to 59, a very interesting account of the transmission of the food and mouth disease to man from the use of milk from cows so affected.

As to pleuro-pneumonia, the milk from cows so diseased has been drunk with impunity. Cows having pleuro-pneumonia give only very small quantities of milk, as the irritation of the parts affected draws away the blood from the lacteal vessels. Probably the exposure of milk to infected air or the adulteration with infected water is generally the cause of disease from the use of milk in ninety-nine cases out of a hundred.

That improper food will affect the milk is undoubtedly the case. Cows fed on distillery swill giving milk low in fat and sugar and high in caseine. The following analysis by Dr. Bartly shows this fact:

Water	89.46
Fat	2.03
Sugar	2.83
Caseine and salts	5.74

One case, at least, is on record of the effect of such milk on children. At a *post-mortem* examination of a young infant, in Brooklyn, fed on such milk, the stomach was found to be filled with a hard, compact mass, which proved to be undigested caseine.

Stale milk must be unhealthy as it would have a tendency to sour. The microscope indicates the age of milk and in this way: the fat globules in pure fresh milk are separated from each other (see photo-micrograph, p.); and are in constant motion as soon as the milk becomes acid, even before litmus paper will detect it, the fat globules collect in groups and remain motionless.

Adulterants.

The substances said to have been used for the purpose of adulterating milk are: Water, sodium carbonate, sodium bi-carbonate, flour, annatto, sugar, caramel, borax, potassium carbonate, glycerine, arrow-root, dextrine, chalk, gelatine, sheep's brains, hempseed, potassium nitrate, starch, and many more besides.

The only ones now used to any extent are water, borax, salt, carbonate of soda, bi-carbonate of soda, sugar and caramel.

Water is added to increase the quantity, borax as a preservative, carbonates of the alkalies to correct acidity, salt to increase the specific gravity, and also to flavor the milk, sugar for the same purpose, and caramel as a coloring agent.

As to the other adulterants said to have been used, the expense would preclude the use of most of them.

Detection of the Adulterants.

Detection of the addition of water from the Specific Gravity.

In the preceding part of this report it is conclusively shown that the specific gravity of the average milk never falls as low as 1.029 at 60 degrees F.

This being the case, if the specific gravity of the milk is determined, the amount of the added water can be ascertained with accuracy. The ordinary hydrometer is not adapted for this purpose, as the space between the specific gravity of distilled water and 1.029 is too small. The lactometer as recommended by Prof. Chas. F. Chandler, however, fulfills all requirements. It is merely a hydrometer whose 0 point is placed at the specific gravity of water, and the 100 point at a specific gravity of 1.029 (See report of Chas. E. Munsell, Ph. B.), and the space between these points, some three and a half inches in length, is divided into 100 points. It therefore, indicates percentage.

If we place this instrument in milk at a temperature of 60 degrees F. and it floats at 90, 85, 80 or 75 degrees, and so on, it would indicate an adulteration by the addition of water of 10, 15, 20 or 25 per

cent, providing always that the appearance and taste indicate the addition of water.

If it floats above 100 degrees, we are reasonably sure, provided the appearance and taste are normal, that no water has been added. Various devices have been resorted to to deceive the inspector, such as partly skimming milk to increase the specific gravity, and then adding water and a little burnt sugar and salt to disguise the color and taste, but with little success, as the records of the courts will show.

All that is claimed for this instrument is that within certain bounds it can tell the amount of water added, and can with a certain degree of accuracy detect skimmed milk. The 100 point being placed at least 6 degrees below the average the lactometer favors the milkman.

Detection of the addition of Water by Analysis.

To do this some standard of purity must be adopted as the water, as before stated, found in milk is the same as any water.

Now the least variable constituents of milk are the solids not fat, and addition of water must reduce them in amount. In the preceding part of this report, 9.2 per cent of solids not fat, was clearly shown to be below the amount usually found in average milk. This being the case, a simple rule of three will indicate the amount of added water. That is, the amount of solids not fat in pure milk are to the amount of solids not fat found as 100 is to the parts of pure milk in the sample under examination. If we suppose, for example, that we find eight per cent of solids not fat, then we make the proportion:

$$9.2 : 8 :: 100 : X = 86.9$$

That is, 86.9 per cent of the mixture of milk and water was milk and 13.1 per cent was added water.

Of all the methods of analysis, I have found the following, recommended by Dr. Waller, to be the most rapid and practical: Weigh out about five grams of milk in a platinum dish, evaporate to dryness on the water bath, dry to constant weight in the air bath, which should never be allowed to attain a higher temperature than 105 degrees C., or lower than 100 degrees C.; cool and weigh. Loss equals amount of water. Extract the fat with ether, dry to constant weight, cool and weigh. Loss equals amount of fat. The ether extract containing the fat is evaporated in a tared beaker until all ether is driven off, dried and weighed; increase in weight equals the amount of fat. The residue in the dish are the solids not fat; place the dish over a Bunsen burner and heat at a red heat until the ash is white, cool and weigh the ash. The solids not fat consisting of sugar, caseine and salts or ash, may be separated as follows: Place the dish containing the solids not fat, on the water bath; fill the dish with a mixture of equal parts of alcohol and water and evaporate to dryness. This will generally make the albumen and caseine perfectly insoluble. Water containing ten per cent of alcohol is now added, and after heating on the water bath, for about fifteen minutes, the water now holding the sugar and soluble salts in solution is to be decanted into a tared platinum dish; repeat this three or four times, evaporate both to dryness, carefully observe if any albumen has run over with the sugar. If so, this must be filtered out and added to the caseine. If none has come over, dry

both residues to constant weight, cool and weigh; now burn off the carbon at a low red heat, until the remaining ash is white, cool and weigh. Subtract the ash from the sugar, and the ash from the caseine, and we have the amounts of the sugar and caseine. Add the weight of the insoluble ash and soluble ash together and we have the amounts of ash contained.

Detection of the removal of Cream.

1st. The cream gauge. This instrument is unreliable in the extreme. The only time that it will indicate the exact amount of cream is when the milk is taken warm from the cow, and placed in cold water. But if the milk is allowed to cool, the full amount of cream can never be made to rise again, by merely putting it in the cream glass, and the older the milk is, the less cream will rise.

Having occasion to test many hundred samples of milk, and not having time to resort to analysis, or the lactobutyometer, it occurred to me that could I restore the milk to its condition when taken from the cow, all of the cream would rise. Therefore, I made the milk under examination slightly alkaline, and heated it to a temperature of 90 degrees F., placed it in the cream gauge, in water at 35 degrees F., and the result was that in at least two hours all of the cream rose. Upon comparing the amounts of cream obtained with the amounts of fat by analysis, I found that one per cent of fat was equal to four per cent of cream, and was invariably in this proportion. The following table shows a few of the results obtained:

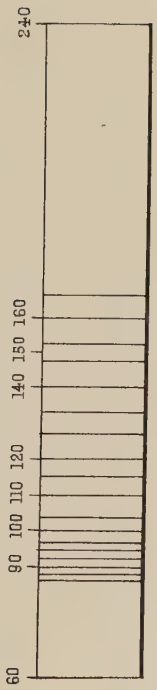
Cream by cream gauge.	Fat by analysis.
10 per cent	2.7 per cent.
12 per cent	3.1 per cent.
4 per cent	1.06 per cent.
3 per cent	.92 per cent.
2 per cent	.51 per cent.
16 per cent	3.90 per cent.

The best method, however, is by analysis, and if we take three per cent of fat as the minimum amount in average milk, the amount removed can be easily determined.

The method described by Prof. Caldwell, that by the use of the lactobutyometer, is accurate, rapid and easy. (See First Annual Report of the Cornell University experiment station.) I never tried this method to any extent, as the courts insist upon a chemical analysis being made in all cases of skimmed milk. Dr. Wm. K. Newton recommends its use, and Dr. Bartly, chemist of the Brooklyn Health board, praises it highly. The microscope will show if a large amount of the cream has been removed by the diminution in the number of fat globules. See photograph from the microscope of skimmed milk.

Sodium, Bi-Carbonate and Carbonate.

First. Excessive alkalinity would lead us to suspect the addition of the above substances. Evaporate to dryness, incinerate and test for carbonic acid in carbonates.



CREAM GAUGE.

Glycerine.

Free the milk solids from fat by ether as before recommended. Dissolve the glycerine out with a mixture of absolute alcohol and ether. It may then be identified by the acrolein fumes, or by adding to it a small amount of powdered borax. Place a portion of this mixture on a loop of platinum wire; set it on fire. A green flame is an indication of the presence of glycerine.

Borax.

Evaporate to dryness, incinerate and test for boracic acid in the ash, either by mixing with glycerine, and observing the green flame produced, or by the examination with the spectroscope, when the bands given in the diagram below will be produced.

Salt.

Evaporate the milk to dryness, incinerate and determine the amount of chlorides by tenth normal solution of nitrate of silver in the usual way.

Potassium Nitrate.

Test for nitrate in the ash.

Sugar and Caramel.

The presence of these would increase the amount of sugar and should this be found to be above five per cent. The method advised in the Analyst, March, 1880, page 37, may be used.

Flour and starch can be detected by the iodine test.

As to the other adulterants given in the table they will seldom if ever be used.

Finally, if the solids not fat are much above the average, a careful examination should be made for adulterations, or if the amount of ash exceeds eight-tenths of a per cent.

I cannot recommend too strongly the use of the microscope in the examination of any sample of milk adulterated with water, for the purpose of detecting any impurities resulting from the addition of impure water, and should any solid particles be seen in the milk a close examination of them by the microscope is recommended.

Below are given photographs from the microscope of pure milk, cream and skimmed milk magnified 420 diameters.

PRESERVED AND CONDENSED MILKS.

Preserved milk is merely milk from which the water has been evaporated and to which cane sugar has been added. They vary, of course, in composition, but the following analysis shows about the average amount of the constituents. (Wanklyn.)

Water	20.5
Fat	10.4
Cane and milk sugar	56.1
Caseine	11.0
Ash	2.0

It is generally made from whole milk.

Condensed Milk,

Or milk condensed without the addition of sugar, is now made from partly skimmed milk, and this fraud is very hard to detect, for if condensed at a high temperature a yellow color and great viscosity are imparted to the milk.

The following analysis show the poorest and richest preserved milk which I have examined:

	No. 1.	No. 2.
Water	59.07	51.43
Fat	5.04	15.37
Solids, not fat	35.89	33.20

(See report of Charles E. Munsell, Ph. B.)

No. 1 was a thick yellow milk of great apparent richness and was made from skimmed milk.

No. 2 was a thin white milk and was made from whole milk. It may be stated that in regard to the quality of preserved milk that the yellow thick milk is generally of the poorest quality.

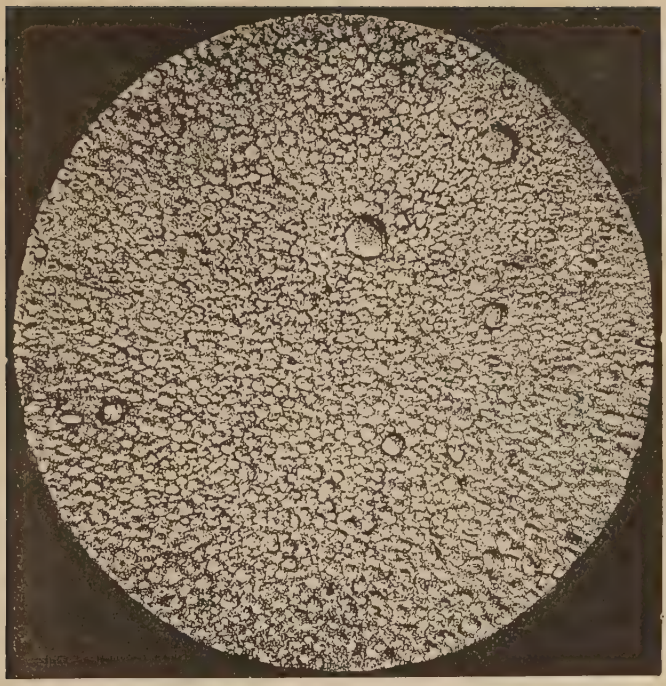
It is well to remark here that the use of sand in the analysis of condensed or preserved milks is absolutely necessary. The analysis is made as follows:

Weigh the dish, then add about ten grams of sand, thoroughly purified; heat to redness, cool and weigh. Next weigh a small glass rod, place the dish containing the sand on the balance and weigh out from one to two grams of the milk; place on water bath and after the milk becomes liquid carefully mix it with the sand; stir with the rod from time to time, so that the milk will not adhere to the dish; dry to constant weight; loss = water; transfer the sand to a tared funnel in the neck of which, a plug of cotton, previously washed with ether, has been placed. Weigh the funnel and sand and note the loss of sand; the loss must be taken into consideration when calculating the final results. Now pour boiling ether through the funnel into a tared beaker, drive off the ether and weigh the beaker and fat; gain in weight equals the amount of fat. Slightly moisten the contents of the funnel with alcohol and water and dry in air bath at 105 degrees C. Now pour boiling water through contents of funnel into a tared platinum dish, evaporate to dryness and weigh. Weight — sugar and soluble ash, incinerate and weigh. Weight equals soluble ash, which must then be subtracted from the sugar. The total ash can be determined by incinerating about one gram of the milk. The caseine is to be determined by difference or by determining the amount of nitrogen, as recommended by Wanklyn, and from that calculating the amount of caseine.

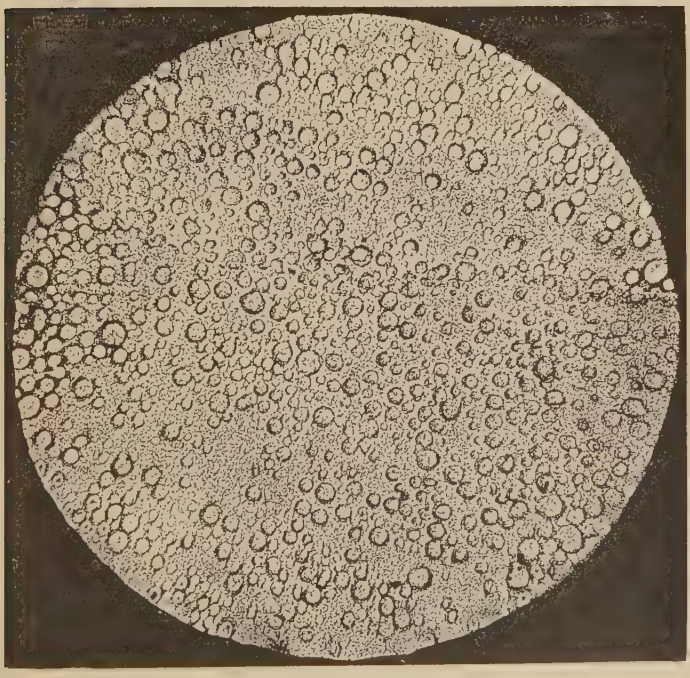
Respectfully submitted,

EDWARD W. MARTIN,

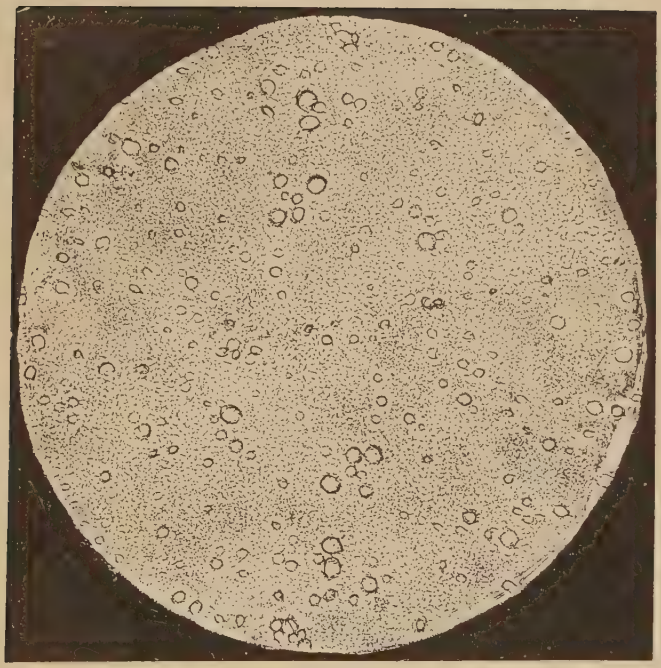
State Inspector of Milk.



CREAM.



PURE MILK.



SKIMMED MILK.